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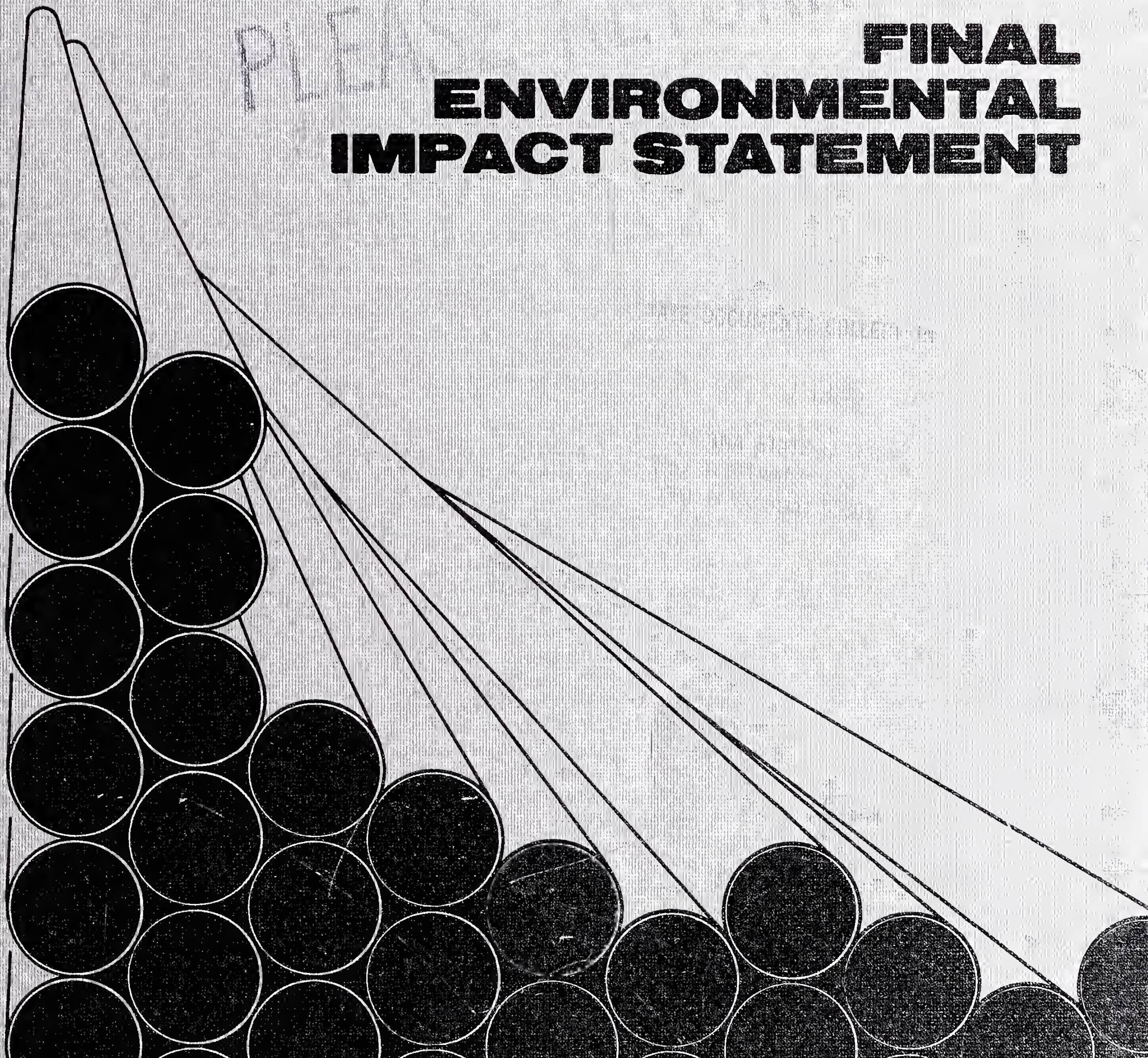

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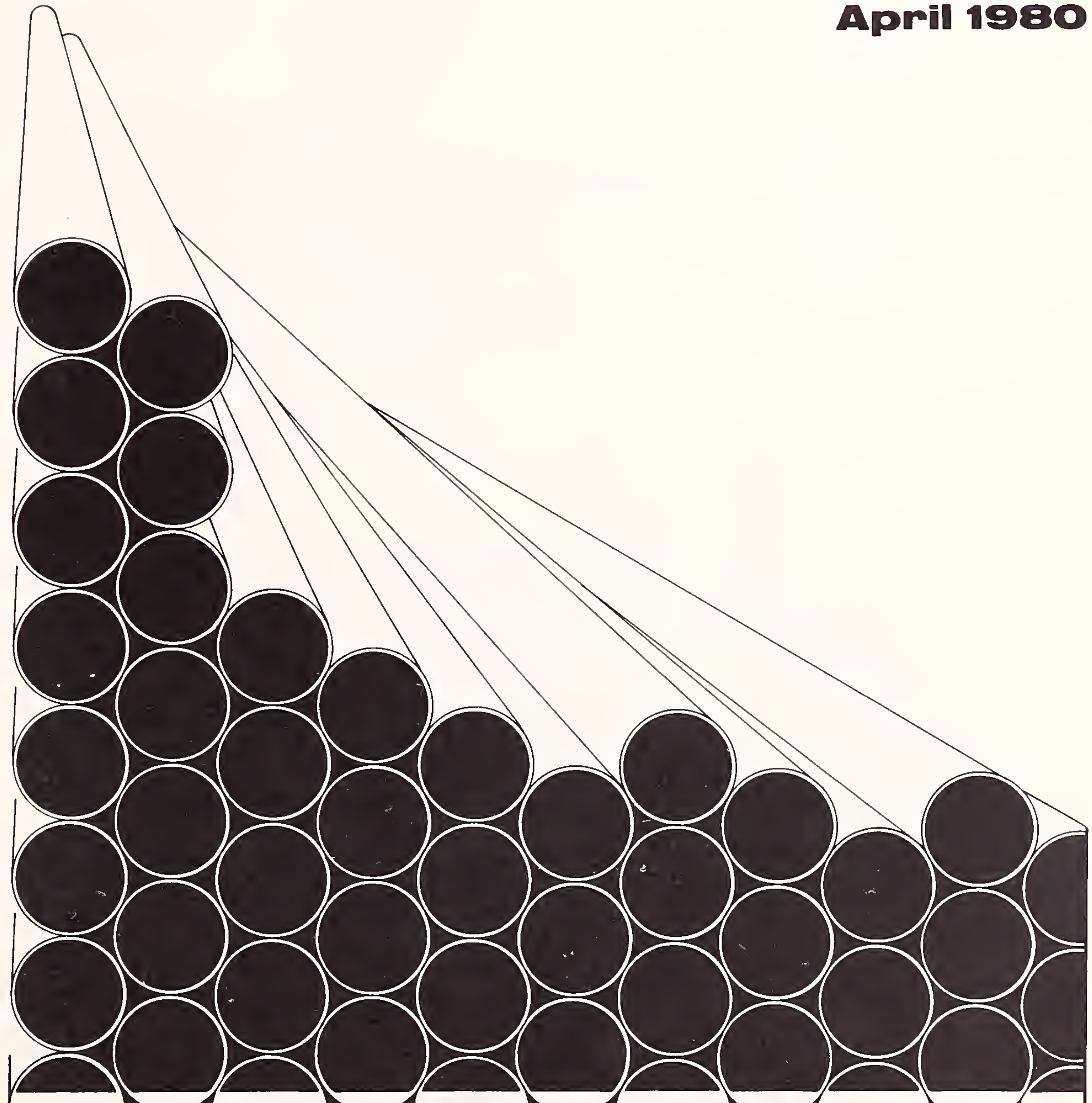

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INTRODUCTION

On October 29, 1979, the Department of Natural Resources and Conservation (DNRC) released its draft environmental impact statement (EIS) on the proposed Northern Tier Pipeline System. As required by the Montana Environmental Policy Act (MEPA), release of the draft EIS was followed by a public comment period and preparation of this final EIS, which contains a summary of DNRC's conclusions (presented as recommendations) and responses to the comments received.

The state has limited authority over the project; however, the Northern Tier Pipeline Company (NTPC) still must obtain a number of state permits and easements. DNRC's recommendations and the data compiled for the draft EIS are for use by state agencies during consideration of NTPC's permit and easement applications.

CHAPTER ONE

SYSTEM ALTERNATIVES

Montana and the rest of the Northern Tier states need secure access to a secure supply of crude oil and refined petroleum products. The Northern Tier Pipeline has been proposed to meet the petroleum needs of Montana and the Northern Tier states. In the draft EIS, DNRC examined Montana's need for crude oil and compared, through a benefit/cost analysis, the merits of the Northern Tier Pipeline and several alternatives to fulfill Montana's need. DNRC also examined a number of federal studies that discussed whether the Northern Tier Pipeline is in the national interest. During the public comment period following release of the draft EIS, several comments regarding the need for the pipeline and the benefit/cost analysis were received. The following additional discussion is provided in partial response to those comments (see also chapter five).

MONTANA'S INTERESTS

The draft EIS concluded that Montana will need additional crude supplies, but that, based on DNRC's benefit/cost analysis,[1] NTPC's proposed pipeline may not be the best alternative for securing those supplies for Montana. Continuation of Canadian exchanges and reallocation of crude produced in Montana are options that may be available to Montana and would be less expensive than foreign or Alaskan North Slope (ANS) crude delivered via the Northern Tier Pipeline.

According to the benefit/cost analysis, the reallocation alternative has monetary net benefits greater than those of the proposed pipeline by at least $35,041,977 at 79,500 m^3/d (500,000 bpd) throughput. Other throughput levels examined by DNRC put the pipeline at a greater disadvantage. A benefit/cost analysis is useful as a decision-making tool but cannot be used as the sole criterion to make decisions on projects of the nature and complexity of the proposed pipeline. For instance, in addition to the monetary costs and benefits considered in the benefit/cost analysis, intangible subjective benefits and costs, including security of crude supply,[2] security of the transportation system, and unmitigated environmental impacts, must be weighed for each of the alternatives.

Security of Supply

With regard to security of supply, the Northern Tier Pipeline's benefit is its access to ANS crude. However, this benefit is uncertain and debatable; several recent studies suggest that ANS crude may be available for shipment on the pipeline in smaller quantities than NTPC had expected. Van Poolen Associates, quoted in USDI (1979a), predicted that production of ANS crude may fall to as low as 32,000 m³/d (200,000 bpd) by 1995; for ANS production to reach the level of 350,000 m³/d (2,200,000 bpd) predicted by the Pace Company (1978) and USDOE (1979a), USDI concluded that new fields with total production rates similar to those of Prudhoe Bay must be discovered. In addition, the U.S. Senate Energy and Natural Resources Committee surveyed West Coast refineries and found that they are processing more ANS crude than previous federal studies assumed they could handle, and that West Coast refiners are interested in obtaining even more ANS crude, but the crude is not available. To sell more ANS crude on the West Coast, ANS producers would have to supply less to their own refiners in the Gulf Coast area. On the other hand, the present attraction of West Coast refiners to ANS crude may be due to price controls on that oil that make it less expensive than foreign crude. If so, there may again be a surplus of ANS crude on the West Coast after price controls are lifted. But if the federal studies are correct, NTPC may not have access to sufficient Alaskan reserves to guarantee Montana a secure supply of crude. If NTPC were forced to depend primarily upon foreign crude for its throughput, international politics could jeopardize NTPC's security of supply, and U.S. dependence on foreign oil would not be reduced.

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[1] See p. 45 for DNRC's sensitivity analysis of assumptions used for the benefit/cost analysis. This sensitivity analysis shows that the conclusion reached does not change with a change in assumptions.

[2] Security of supply is defined as access to crude supply not subject to interruption by embargo or other curtailment. It does not refer to security from sabotage or mechanical failure.

Because the reallocation alternative relies on Montana and Wyoming crude oil and would thus be more insulated from the fluctuations of the international market, this alternative may provide more security to Montana. However, with the advent of deregulation, U.S. refiners that lose international sources of crude will bid for available domestic supplies, perhaps cutting into Montana's supplies. The reallocation alternative also relies on Canadian exchanges, and is therefore exposed to the risk of future Canadian policy changes that may affect Montana's access to Canadian crude. Even so, future access to domestic and Canadian crude seems more secure than access to foreign crude.

Security of the Transportation System

Although the International Agreement Concerning Transit Pipelines between Canada and the U.S. guarantees against arbitrary and exorbitant tariffs and against disruptions of flow, and although eastern Canadian dependency on crude oil flows through U.S. territory seems to be a further guarantee against capricious action, some uncertainty remains about the security of pipeline systems on Canadian soil. Our relations with Canada in the future may change; Canada may require unreasonable tariff charges, or the security of a pipeline on Canadian soil may be reduced by other means. If this uncertainty is deemed important, NTPC has an advantage over rival pipeline proposals.

The tanker portion of the transportation route must also be considered in evaluating the security of transportation. In the event of war, tanker routes would probably turn out to be the most vulnerable portion of any crude oil transportation system. Of the pipeline proposals, the Northern Tier Pipeline, which includes the longest tanker route, was ranked second from a national security perspective by the Joint Chiefs of Staff (USDI 1979b). The Foothills proposal with the shortest tanker route, was ranked first.

Environmental Costs

The reallocation alternative, involving no construction, has no significant environmental damage associated with it. In constructing a pipeline such as the one proposed by NTPC through fragile and rugged areas, some environmental damage is inevitable; DNRC's draft EIS identified many adverse effects of construction and operation that cannot be avoided if the line is built, although the number and magnitude of adverse effects can be reduced through proper use of permitting conditions and surveillance during construction and adequate oil-spill mitigation and compensation programs.

Conclusions

The benefit/cost analysis showed the monetary advantage of the reallocation alternative over the Northern Tier Pipeline as $35 million. The nonmonetary benefit of reallocation is that it would involve no environmental damage. Using the benefit/cost analysis as the only decision-making tool: if the value of the Northern Tier Pipeline's nonmonetary benefits of security of supply and security of transportation were judged greater than reallocation's environmental benefits plus $35 million, then the Northern Tier Pipeline would be the preferred alternative for Montana. If not, the preferred alternative would be reallocation of crude oil flows.

As things stand, Montana's preference among the alternatives is of little consequence. Montana state law gives insufficient authority to state and local agencies to prohibit the construction of pipeline projects such as the Northern Tier Pipeline. Therefore, even if the project is not considered to be in Montana's interest, Montana state government can have little effect on the decision to build the pipeline.

Only 10 percent of the crude transported on the Northern Tier Pipeline will be delivered to Montana; the major projected markets are refineries in the Midwest. If the project is considered to be a national interest, then Montana's need for crude, or lack of need, will not be a major concern, and Montanans can only try to ensure that the costs to the state are minimized. Montana's permitting process, using the recommendations contained in this EIS, can help. Those costs that are neither mitigated nor compensated would be the state's contribution to meeting the national interest.

NATIONAL INTEREST

Deciding whether the pipeline is in the national interest requires an analysis of several variables—among them, private profitability, which depends on the demand for crude oil delivered by pipeline, and the nonmonetary concerns of security of supply, security of the transportation system, and environmental costs. Also to be considered is whether the nation should continue to rely on fossil fuels. Nonmonetary costs and benefits are discussed above; discussed below are the demand for crude oil and the President's recent action under the Public Utility Regulatory Policy Act.

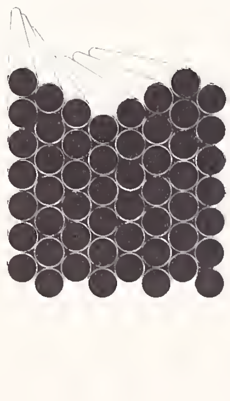
Demand

Reports by the U.S. Department of Energy (1979b) and the U.S. Department of the Interior (1979a) cast doubts on the existance of sufficient demand in the Northern Tier and Midwestern states to justify construction of the Northern Tier Pipeline. USDI's analysis shows that in the most probable supply and demand case, Illinois, Indiana, Ohio, Michigan, and Wisconsin will have petroleum supply surpluses of 92,200 m^3/d (580,000 bpd) through the year 2000; Minnesota, Montana, and North Dakota will have supply shortages of 25,400 m^3/d (160,000 bpd) or less by the year 2000. These figures do not include any increased transportation capacity beyond what is currently available or approved for construction. Exchanges with Canada are not included. USDOE's analysis (1979b) concludes that the most probable transportation deficits for the Northern Tier states would be 6,680 m^3/d (42,300 bpd) in 1980 and 22,300 m^3/d (140,300 bpd) by the year 2000, if no new transportation capacity is installed and if there is no Canadian exchange crude. The economic viability of the pipeline may depend on its ability to transport much greater quantities of crude than these studies indicate will be demanded. The Pace Company, on the other hand, forecasts a greater demand for Northern Tier Pipeline crude oil than the federal studies. Its 1978 report predicts deficits of 69,640 m^3/d (438,000 bpd) in 1980 and 112,870 m^3/d (710,000 bpd) in 2000 for states in Petroleum Administration for Defense districts 2A, 2B, and 4 (which include Kentucky, Missouri, Tennessee, South Dakota, Iowa, Kansas, Oklahoma, Nebraska, Colorado, Utah, and the Northern Tier states with the exception of Washington and Oregon).

The economic viability of the pipeline will be determined when NTPC attempts to arrange financing for the project. If NTPC can secure agreements with purchasers for levels of throughput adequate to cover its costs, then lenders will be likely to supply investment capital. On the other hand, if the federal analyses are correct in their implication that the project may not be economically viable, NTPC will not secure the needed throughput agreements, and lenders will not risk investment capital.

Title V

Title V of the Public Utility Regulatory Policy Act directs President Carter to designate which, if any, of the competing pipeline proposals is in the national interest. On January 17, 1980, the President approved the Northern Tier Pipeline for the special procedures set up under Title V to hasten the federal permitting process. This approval was conditional on NTPC obtaining adequate financial support within one year from the date of that decision or six months from the issuance of a permit by the state of Washington, whichever is later. If NTPC is unsuccessful, the special procedures granted NTPC by Title V will be revoked and granted to the Trans Mountain Pipeline.



CHAPTER TWO

RECOMMENDATION I

DNRC RECOMMENDED ROUTE

DNRC has identified a route that is similar to NTPC's proposed route (NTPR), but that would have less overall adverse impact on Montana's environment (see map, p. 11). DNRC recommends that the state agencies involved in the permitting process for the Northern Tier Pipeline adopt this route, referred to hereafter as the DNRC Recommended Route.

In its comparison of routes in the draft EIS (chapter seven), DNRC found that for the most part the overall impact of the routes does not greatly differ. Consequently, DNRC concludes that centerline evaluation and construction monitoring are as important as route selection to minimize potential impacts of the pipeline. DNRC has included in the DNRC Recommended Route the areas where a change in route would reduce adverse impact; with one exception, these areas are all west of Bonner.

Chapter two includes two sections. The first section describes the DNRC Recommended Route by describing the differences between it and NTPR. Also included in this section is a discussion of alternative routes in the Siegel Creek area. These routes, and an alternative route along Driveway Ridge, were identified by the U.S. Forest Service (USFS) after DNRC's draft EIS was compiled. The USFS routes in the Siegel Creek area are included in the description of the DNRC Recommended Route because DNRC considers further study necessary to determine the best way through the area. The USFS Driveway Ridge Route is not included as part of the DNRC Recommended Route and is therefore discussed in chapter six as an addition to the discussion of alternative routes in the draft EIS.

The second section of chapter two compares the DNRC Recommended Route with the routes compared in the draft EIS.

COMPARISON OF THE DNRC RECOMMENDED ROUTE AND NTPR

Lower Prospect Creek Area

The DNRC Recommended Route separates from NTPR for a short distance below the mouth of Wilkes Creek, avoiding two crossings of Prospect Creek and following the existing road more closely. This adjustment would keep the pipeline farther away from the creeks. It is not a major change from NTPR and may be again modified during centerline evaluation.

Clark Fork Area East of Thompson Falls

East of the Thompson River crossing, the DNRC Recommended Route again diverges from NTPR, staying north of the Clark Fork and Highway 200 for about 10 km (6 mi). The pipeline would be separated from the river by the highway and the Burlington Northern Railroad. The route then turns south crossing the river at a point where the river is narrower than at the NTPR crossing, and rejoins NTPR.

The advantage of the DNRC Recommended Route over NTPR in this area is that it avoids low alluvial islands in the Clark Fork. This would result in less instream disturbance and therefore fewer impacts to aquatic habitats. There is less risk of oil damaging the Clark Fork on the DNRC Recommended Route than on NTPR because the route is generally farther from the river, separated from it by the highway and railroad.

Construction in this area would be difficult on the DNRC Recommended Route, which crosses a steep cliff face and adjoining talus slopes approximately 3 km (2 mi) east of the Thompson River. The cliff cannot be bypassed because the highway, railroad, and river all run through this congested area. Construction would require extensive sidecuts and may temporarily interrupt highway and rail traffic. There would be some visual impact during construction; however, since the DNRC Recommended Route closely parallels existing utility and transportation corridors in this area, visual and other environmental impacts already exist.

The DNRC Recommended Route traverses more bighorn sheep severe winter concentration areas in the Clark Fork area east of Thompson Falls, while NTPR traverses more deer and elk winter range (including some severe winter concentration areas along the south bank of the Clark Fork and along Eddy Creek).

Siegel Creek-Siegel Pass Area

USFS has identified three alternatives to NTPR in the Siegel Creek area (1979a). These routes were not identified in time for DNRC to address them in the draft EIS. NTPR goes along the bottom of the narrow Siegel Creek canyon, which is avoided by all of USFS's routes. To do this, however, the routes cross many steep slopes and climb to an elevation of 2,012 m (6,600 ft). This high elevation would cause severe construction problems and would require more pumping capacity than needed for NTPR; consequently costs would be increased. However, any of the USFS routes would result in substantially fewer impacts to aquatic resources and forest production than would NTPR.

Because of the great impact of any route through this area, DNRC, NTPC, and USFS should closely examine all routes prior to making a recommendation. If it becomes necessary to follow NTPR up the Siegel Creek valley, DNRC recommends that NTPC consider adopting a site-specific compensation plan for this area.

Upper Ninemile Creek - Frenchtown Area

Just southeast of Siegel Pass, the DNRC Recommended Route leaves NTPR for roughly 60 km (38 mi), going northeast of a heavily forested area crossed by NTPR and following the upper slopes of the stream-dissected bench northeast of Ninemile Creek. The route passes through some heavily logged and roaded terrain before crossing NTPR about 1.5 km (0.9 mi) due north of Frenchtown.

The primary DNRC and public concerns in the upper and middle reaches of the Ninemile area are seismic hazard and risk of oil spills into Ninemile Creek, a scenic stream with valuable aquatic resources. The Ninemile Fault is possibly now "active," in that a number of weak earthquakes have occurred in a poorly defined zone which approximately coincides with the fault (see **Northern Tier Report No. 4**). The draft EIS concludes that earthquakes on the fault pose little risk to the pipe, but that the fault should be studied further by NTPC before final pipe design and routing.

The DNRC Recommended Route partially follows the USFS Ninemile Route A, which is 0.4 to 0.8 km (0.25 to 0.50 mi) south of the Ninemile Fault. USFS field inspections (USDA 1979b) found an intensely fractured, clayey, wet zone along the fault. The zone is widest between Sixmile and McCormick creeks and contains many slumps. USFS suggests that the pipeline be placed at least. 0.8 km (0.5 mi) south of the fault between Sixmile and McCormick creeks, where the rock in the fault zone was least stable. Elsewhere along the fault, the pipeline could probably be placed within 0.4 to 0.8 km (0.25 to 0.5 mi) of the fault.

NTPR is farther from the fault than is the DNRC Recommended Route and is therefore less likely to be damaged by an earthquake; on the other hand, if a spill should occur, NTPR is closer to Ninemile Creek, which could be badly damaged by oil. Based on analyses of the relative likelihood of seismic damage versus risk potential for oil spills, DNRC concludes that it is best to route the pipe as far from Ninemile Creek as is feasible; the DNRC Recommended Route meets this criterion.

The DNRC Recommended Route also (1) minimizes sedimentation impacts to Ninemile Creek, (2) avoids some of the roadless habitats and elk summer security areas near the head of Ninemile Creek, and (3) uses existing rights-of-way. Other impacts would not differ significantly between the DNRC Recommended Route and NTPR.

Frenchtown - Rattlesnake Creek Area

From Frenchtown to Grant Creek just west of Missoula, the DNRC Recommended Route closely parallels Interstate 90. The route extends east from Grant Creek, crossing to rejoin NTPR at Rattlesnake Creek.

The primary advantage of the DNRC Recommended Route here is that it skirts most of the hills on the northeast side of the Missoula Valley. It also has the advantages of paralleling an existing major transportation corridor; however, NTPR also parallels an existing transmission line corridor in this same area.

NTPR passes through approximately 6.4 km (4 mi) more land with shallow, good-quality ground water then does the DNRC Recommended Route. Rural developments are for the most part avoided by both routes, although on either there would be need for centerline adjustments.

Colstrip - Hot Springs 500-kV Transmission Right-of-way

The DNRC Recommended Route closely parallels the Montana Power Company's corridor for the Colstrip-Hot Springs 500-kV line through the Big Belt Mountains east to the Ringling area. On the west slopes of the Big Belt Mountains, both projects would have relatively high impact on vegetation, wildlife, land use, and visual quality; therefore, paralleling the rights-of-way is advantageous.

There is a possibility that close paralleling of the transmission line and pipe could induce electrical currents in the pipeline. However, this could be avoided when locating the centerline of the pipeline right-of-way.

Flatwillow - Big Dry Creek Area

The DNRC Recommended Route makes a minor deviation from NTPR between Flatwillow and Big Dry Creek, in Petroleum and Garfield counties. This change moves the route approximately 1.6 km (1 mi) to the north, bringing it close to Highway 200 and avoiding some heavily dissected terrain. Being closer to the highway results in easier access during construction and during possible oil spills.

COMPARISON OF THE DNRC RECOMMENDED ROUTE AND OTHER ROUTES

DNRC Modification Route

This route is for the most part identical to the DNRC Recommended Route statewide. There are two major exceptions: the DNRC Recommended Route follows NTPR rather than the DNRC Modification Route in the Garnet Range area and in the Jordan-Circle area. DNRC recommends following NTPR in the Garnet Range area to avoid (1) the crossings of and close approaches to the Clark Fork and the Little Blackfoot River and (2) severe construction problems in the extremely narrow rock-walled canyons of the middle reach of Ten Mile Creek. In the Jordan-Circle Area, DNRC recommends following NTPR because (1) it is 2.6 km (1.6 mi) shorter than the DNRC Modification Route and (2) it avoids crossing coal fields.

Arlee Route

The Arlee Route avoids the difficult construction and environmental problems that would be encountered on the routes in the Siegel Creek-Siegel Pass area. Partially offsetting this major advantage is the additional 8 km (5 mi) on the Arlee Route. Aquatic impacts from the Arlee Route would probably be less than from the DNRC Recommended Route primarily because it avoids the Siegel and Ninemile creek drainages. The Confederated Salish and Kootenai Tribal Council has denied NTPC permission to cross the Reservation. Should the Tribal Council reverse its position, the Arlee Route would be substantially better than either NTPR or the DNRC Recommended Route and consequently would be recommended.

Knox Pass Route

The DNRC Recommended Route has two significant advantages over the Knox Pass Route: (1) it is 16 km (10 mi) shorter then the Knox Pass Route and (2) it would result in less impact on aquatic resources because the Knox Pass Route repeatedly crosses and closely parallels several streams, the St. Regis River, and the Clark Fork.

The Knox Pass Route is generally closer to the Clark Fork in an area of higher fisheries value than the DNRC Recommended Route. The Knox Pass

Route crosses approximately twice as much land in ground-water risk category 5 (highest risk) than the DNRC Recommended Route. Adverse impacts to portions of the Old Mullan Road northwest of St. Regis could also result from the Knox Pass Route. Although other impacts are similar for the two routes, the Knox Pass Route has no advantages of any significance over the DNRC Recommended Route.

Hi-Line Route

The DNRC Recommended Route crosses the Blackfoot and Missouri rivers, but avoids staying in the Blackfoot drainage. The Hi-Line Route avoids the river crossings, but crosses many class 3 streams within the drainage; an oil spill near any of these streams would likely reach the Blackfoot River. The DNRC Recommended Route also avoids the proposed BLM wilderness study areas, which would be crossed by the Hi-Line Route, and the Medicine Lake area.

Raynesford Route

A number of concerns are roughly equal on the Raynesford Route and the DNRC Recommended Route: terrain, engineering, and hydrologic constraints; earthquake hazards; mineral resources crossed; new electric transmission corridors and maximum horsepower required; and impacts to ground water, visual quality, and soils. The Raynesford Route crosses a shorter distance of hard bedrock that would require blasting, but poses more risk of impact to wildlife than does the DNRC Recommended Route. The Raynesford Route would avoid any impact to Canyon Ferry Reservoir, but would have the same impacts to the Blackfoot drainage as the Hi-Line Route while not avoiding a crossing of the Missouri River. The DNRC Recommended Route stays within 0.5 km (0.3 mi) of existing corridors for approximately 411 km (257 mi) as compared to 347 km (217 mi) on the Raynesford Route.

St. Ignatius Route

Like the Arlee Route, the St. Ignatius Route crosses the Flathead Indian Reservation and avoids the construction difficulties encountered in the Siegel Creek-Siegel Pass area. Because of the high risk of environmental impact in the St. Ignatius-Avon area, DNRC does not recommend this route for further consideration. In addition, the Confederated Salish and Kootenai Tribal Council has refused to grant NTPC permission to cross the Reservation.

STATE RECOMMENDED ROUTE

CHAPTER THREE

RECOMMENDATION II

INTERAGENCY PIPELINE TASK FORCE

In the draft EIS, DNRC presented three possible state surveillance alternatives, two of which included establishment of a State Pipeline Coordinator's Office (SPCO) to coordinate state involvement during construction of the proposed project. The initial concept of SPCO appeared to be an efficient means of mitigating potential social, economic, and ecological impacts of the Northern Tier Pipeline. It was based in part on an analysis of the state and federal surveillance of the Trans Alaska Pipeline System (TAPS).

In general, public comments supported state surveillance alternative A; however, after further study, DNRC concluded that establishment of SPCO was not possible under Montana law.

DNRC therefore recommends that the Governor establish an Interagency Pipeline Task Force (IPTF). Because pipelines such as the Northern Tier Pipeline are not covered by the Major Facility Siting Act, and in view of previous legislative action denying the state of Montana authority over pipeline siting, IPTF could not have any siting jurisdiction on private lands or authority to enforce permit conditions and easement stipulations issued by state agencies. Rather, relying upon voluntary cooperation, IPTF would coordinate the activities of state agencies by serving as a point of contact for NTPC and federal agencies and by providing informational support to all state agencies that have authority over the pipeline under existing law. It would also advise private landowners when requested. As a result of IPTF serving as the coordinator of the state agencies and advising private landowners, the permitting process would be expedited.

NTPC has agreed in principal to the functions and purpose of IPTF, and to its funding. The state and NTPC will enter into cooperative agreements between the state agencies and NTPC following the issuance of this final EIS; the agreement will specify in detail IPTF's function, in compliance with the Governor's directive. However, the general functions and organization of IPTF have been agreed upon and are discussed in the following sections.

ORGANIZATION OF IPTF

IPTF's coordinator and core staff would consist of not more than six people, and would be essentially working for all of the agencies having permitting authority over the pipeline (see table 1). Additional support staff would include assigned agency personnel and private contractors; they would supply the needed expertise for IPTF activities. The director of each permitting agency would also appoint one or more representatives to act as liaisons between the agency and IPTF's coordinator, who would be responsible for facilitating IPTF activities. State agencies involved in IPTF would include the Historic Preservation Office (HPO); DNRC; and the Departments of State Lands (DSL); Fish, Wildlife, and Parks (DFWP); Highways (DH); and Health and Environmental Sciences (DHES).

TABLE 1. RESPONSIBILITIES OF STATE AND LOCAL AGENCIES REGARDING PIPELINE LOCATION AND CONSTRUCTION, AND POSSIBLE ACTIONS REQUIRED FOR PIPELINE SITING AND CONSTRUCTION

ACTIVITY REQUIRING ACTION	FORM OF ACTION	LOCATION	TIMING OF ACTION			REMARKS
			Planning	Construction[1]	Post Construction	
CITY AND COUNTY GOVERNMENTS						
Construction not in compliance with local zoning or planning	Zoning permit	Area covered by local planning	Issue permit	Monitor		Local zoning or planning control differs along pipeline route
Construction over county roads	Permit	County roads	Issue permit	Monitor		Crossing of roads owned by county requires supervision after issuance
CONSERVATION DISTRICTS						
Construction across perennial streams	Permit	Stream/river	Field work	Issue permit/ surveillance	Monitor	Permit may be granted before construction but monitoring must occur during construction
DEPARTMENT OF FISH, WILDLIFE AND PARKS						
Crossing of land owned or leased by the department	Easement	State lands	Grant easement	Surveillance		Easements can be issued prior to construction but conditioned by DFWP findings
Construction over streams or rivers	Recommendation	Stream/river	Field work	Recommended action	Monitor	Recommendations to conservation districts, and to USFS for national forests and "404 permit"
Construction affecting wildlife habitat	Recommendation	Key wildlife habitat	Field work	Recommended action	Monitor	Recommendations based on Fish and Wildlife Coordination Act USC 16 661 to 666C
DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES						
Construction affecting air quality						
- General	Permit	Construction and pump sites	Issue permit	Monitor	Monitor	For petroleum storage and airborne particulates from road construction dust and open burning; issued before construction but dependent on DHES monitoring
- Open burning	Permit	Burn site	Issue permit	Monitor		Review and conditions
Construction affecting water quality						
- General	Permit	Stream/river	Issue permit	Monitor	Monitor	Allows short-term activities which will create turbidity in excess of water-quality criteria
- Discharge test water	Permit		Issue permit	Surveillance		Discharge hydrostatic test water
Construction affecting municipal water sheds	Permit	Stream/river	Field work	Issue permit/ surveillance	Monitor	Contamination of water sources prohibited
DEPARTMENT OF HIGHWAYS						
Construction along and crossing highway right-of-way	Encroachment permit	Highways	Issue permit	Monitor		Regulates the location of a crossing
Crossing highway right-of-way	Permit	Highways	Issue permit	Surveillance		Permits construction of a ditch across a state or federal road

ACTIVITY REQUIRING ACTION	FORM OF ACTION	LOCATION	TIMING OF ACTION			REMARKS
			Planning	Construction[1]	Post Construction	
DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION						
Crossing state forest land	Easement	State lands	Field work	Issue permit/ surveillance	Monitor	Forestry Division administers state forest lands; Board of Land Commissioners determines if easements are granted
Hydrostatic testing	Water use permit		Issue permit	Surveillance		Any appropriation of water requires water use permits
Forest slash burning	Permit	Burning site	Issue permit	Surveillance		Granted by the Forestry Division
DEPARTMENT OF STATE LANDS						
Crossing state land	Easement	State lands	Field work	Issue permit/ surveillance	Monitor	Granting of easement may depend on a survey of cultural resources
Crossing navigable river bottoms	Easement	River bottoms	Field work	Issue permit/ surveillance	Monitor	State owned river bottoms - require crossing easement
Removal of fill material	Permit	Stream/rivers, quaries, mines	Field work	Issue permit/ monitor	Monitor	Permit limits amount that can be removed and places certain conditions on permittee
HISTORIC PRESERVATION OFFICE						
Construction affecting historic or other cultural sites	Permit	All lands	Field work	Issue permit/ monitor		Authority over state and signoff authority over federal lands, conditioned upon discovery of any cultural resources during construction

[1] Monitoring: periodically spot checking for violations of permit or easement.
Surveillance: actions involving field teams overseeing construction at a specified location. This means an intense regulatory action.

The Montana Association of Conservation Districts (MACD) would be an ex officio member of the task force. The coordinator, core staff, and contractors would be housed and under the administrative control of DNRC because of the department's familiarity with the project.

COORDINATING ACTIVITIES

Based on voluntary cooperation by agencies, coordination would focus on reducing duplicate efforts and expediting the permitting process to the extent possible under existing legal mandates. Several activities could be coordinated through IPTF, including the following:

Centerline Study

After a pipeline route has been selected, a centerline on state lands will be identified through centerline evaluation. Centerline evaluation studies could be facilitated by IPTF's coordinator with direction from the permitting agencies, and include field work and evaluation by the support staff and technical input by IPTF. Where appropriate, suggested adjustments to the centerline could be made on lands regulated by the permitting agencies. In addition, although the state of Montana has no pipeline-siting authority on private land, private landowners could request advice from IPTF regarding centerline location on their property. Environmentally and socially sensitive areas that require permitting by a state agency could be jointly evaluated by IPTF and NTPC. Sensitive areas may include:

1) Areas with high earthquake potential
2) Areas of potential landslides and slumps
3) Areas of shallow, high-quality aquifers
4) Recreational or historical sites
5) Some stream crossings, especially in or near streams during seasons of fish migration, spawning, and egg and larvae rearing
6) On or near winter ranges (or other seasonal-use areas such as calving areas) important to moose, elk, deer, antelope, mountain sheep and mountain goats

7) In the vicinity of rookeries, active grouse strutting and dancing grounds, or raptor nests during spring and summer
8) Near migration routes of large mammals (especially routes between summer and winter range) during periods of migration, unless proper skip-trenching is used to allow movement of animals
9) In the vicinity of cattle-calving areas during spring months

Centerline evaluation will be required on lands regulated by permitting agencies; therefore, an interagency effort is beneficial.

Review of NTPC's Plans and Designs

NTPC has developed plans to address, avoid, or mitigate impacts. Each participating state agency will review those plans for its area of jurisdiction. IPTF could assist in reviewing and evaluating the plans and then submit them to each agency for final approval. Plans that could be evaluated by IPTF are discussed below.

Oil-Spill Contingency Plan. In general, the oil-spill contingency plan would focus on leak detection; spill containment and cleanup, including wildlife care, land restoration, and similar factors; and pipeline-repair procedures. DSL, DHES, DFWP, and DNRC may all require approval of this plan if it pertains to their permitting process.

Reclamation Plan. The reclamation plan would be expected to conform with DSL reclamation guidelines; other state agencies may have independent requirements for reclamation. DSL has authority for enforcing reclamation on state-owned lands only and would continue to monitor reclamation after pipeline construction.

Quality-Control Plan. The quality-control plan should be comprehensive and designed to ensure compliance with proposed environmental and technical conditions or stipulations on all sections of the pipeline requiring state of Montana permits. The following may be addressed:

1) Measures to detect and correct conditions that are hazardous to the safety of the workers or to public health
2) Measures to detect and correct conditions that may seriously damage the environment or the pipeline
3) Procedures for quality-control management, planning and inspection
4) Surveys and field inspections
5) Quality-determination records to ensure satisfactory data identification and retrieval

Final Design. Final design plans would be submitted after the centerline was selected and right-of-way easements acquired. They may include:

1) Construction guidelines for the pipeline, pumps, and associated facilities
2) Specifications for pipe, pumps, valves, and other materials for the construction contracts
3) Construction blueprints for pipeline and associated facilities

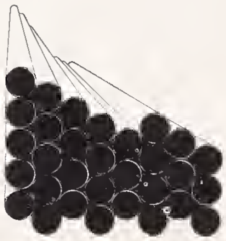
Information Program

IPTF's coordinator would serve as the point of contact between the state agencies and NTPC, and between the state and the BLM pipeline monitoring office. The coordinator would work closely with each when any problems arose. IPTF would ensure that information concerning general pipeline construction and government involvement in the project was available.

Landowners directly affected by the pipeline would be informed of the establishment of IPTF and its functions. They could also be informed of the general process of granting easements and of the state's permitting condition. This informational function of IPTF would be coordinated with NTPC and other interested parties.

Logistics of Surveillance

While state agencies would be responsible for enforcing their respective permit conditions or easement stipulations, IPTF could coordinate the logistics of surveillance. For example, IPTF could arrange for a surveillance team member of one agency to advise or inspect an area under the jurisdiction of a second agency if that agency did not have the necessary staff.



CHAPTER FOUR

RECOMMENDATION III

COMPENSATION FOR IMPACTS

The draft EIS documents that construction of the proposed pipeline system would result in adverse impacts, some of which could not be mitigated. Compensation for unmitigable impacts is included as a form of mitigation in the Council for Environmental Quality's (CEQ) guidelines for the National Environmental Policy Act (NEPA), but federal authority for requiring it is unclear. Likewise, it is doubtful that compensation could be required under MEPA, although some Montana permitting agencies may have authority to do so under agency statutes. Nonetheless, DNRC believes that compensation is mitigation of impact and that impacts can be compensated in a number of ways. Therefore, DNRC recommends that NTPC develop and adopt a compensation plan in cooperation with the state through the Interagency Pipeline Task Force. Any compensation plan adopted by NTPC should probably consider the compensation needs of all states along the route and meet the essential expenditure test of the Federal Energy Regulatory Commission during the establishment of tariffs and rates. Private landowners could determine appropriate compensation during easement negotiations with NTPC.

In this chapter, three categories of compensation are identified and options given for each. Since DNRC cannot recommend any of the options, they are presented only to illustrate the kinds of compensation measures available; DNRC acknowledges that there may be others. The second part of the chapter gives several examples of compensation as mitigation.

OPTIONS FOR A COMPENSATION PLAN

DNRC has identified three categories of compensation. First, compensation could address the unmitigated impacts that would occur regardless of pipeline location. These impacts include direct disturbance of land on the 27-m-wide (90-ft-wide) construction right-of-way, loss of 59 ha (145 acres) to pump stations and delivery facilities, impacts to aquatic systems associated with river and stream crossings, and impacts on energy-use patterns. Second, compensation of impact could be considered as an alternative to centerline relocation on a site-specific basis. Compensation could be employed where it is determined to be more cost-effective than rerouting. Third, specific compensation requirements of unforeseen impacts (for example, fires or major mainline oil spills) could be determined on a case-by-case basis. Each of the three categories of compensation is discussed below.

General Compensation

The general compensation requirements of NTPC's project could, in theory, be precisely determined. For example, use of the **U.S. Fish and Wildlife Service Habitat Evaluation Procedures** (Schamberger and Farmer 1978) would allow specific compensation requirements for fish and wildlife impacts to be quantified. However, for a 1,014-km-long (630-mi-long) project traversing virtually all major habitats of the state, such documentation would be costly. It would be more cost-effective in this case to apply the funds which would otherwise be spent on such study directly to compensation programs.

Funding of a general compensation plan could be based on a percentage of pipeline costs. For example, without recommending a specific percentage, funds equal to one-half of one percent of the estimated cost of construction across Montana plus the same percentage of the annual profits resulting from Montana revenues could be used for compensation. This amount could include the following for compensation of impacts to land and

1) Establishing a trust fund for stream habitat improvement projects approved under the Montana Conservation Districts' "310 program." By tying in with this existing program, overhead and administrative costs would be kept to a minimum, and the money could be spent where it would do the most good for the resource.
2) Providing funds to appropriate agencies for the acquisition or protection of key threatened wildlife habitat in Montana. For example, riparian cottonwood forest habitat could be purchased.
3) Providing funds to appropriate agencies for a study of right-of-way impacts on Montana habitats and possible means of enhancing wildlife habitat by right-of-way management. The results of this study would be applicable to future pipeline and power line projects and could result in substantial long-term wildlife benefits.
4) Providing funds to appropriate agencies for research to gain more knowledge of pipeline construction; for example, geologic studies of quaternary sediments, recently active faults, and bedrock stratigraphy of poorly exposed formations could be done.

Compensation as an Alternative to Centerline Relocation

In situations where a clear choice is apparent between (1) adopting NTPC's preferred centerline where it crosses an environmentally sensitive area, resulting in an unmitigable impact, and (2) avoiding the impact by centerline relocation that adds to the length of the line and increases construction costs, a benefit/cost analysis could be done to determine whether direct in-kind compensation would be more cost-effective than rerouting. The most cost-effective strategy could then be employed to prevent any net loss to private and public resources.

In certain situations, compensation may yield greater and more cost-effective benefits than other mitigation alone. For example, consider the Prospect Creek segment of NTPR compared to the USFS Driveway Ridge Route (see p. 46). NTPC's route has been strongly opposed and would result in serious adverse effects. Although the USFS Driveway Ridge would avoid many of the potential impacts, and hence would be an effective means of mitigation, it would add 6.7 km (4.2 mi) to the length of the line; USFS estimates that construction costs would be increased by $2.4 million. If construction were allowed to take place along Prospect Creek (and the resulting impacts were absorbed), and if the $2.4 million were spent instead on a well-designed compensation program, it is likely that the net losses of public and private resources would be less than those resulting from the USFS Driveway Ridge Route.

Areas where cost-effective resource enhancement could be employed during right-of-way restoration could be identified during centerline evaluation (for example, areas where wildlife cover is presently limited but where suitable cover could be easily created during revegetation, or areas where wetlands could be created using construction roadway bankments or borrow pits).

Compensation Identified During Pipeline Construction and Operation

Compensation could be made for unforeseen or catastrophic impacts resulting from pipeline construction and operation (for example, forest fires, fuel-tank explosions, or ground-water contamination). Compensation payments for mainline oil spills should be determined on a case-by-case basis.

COMPENSATION AS MITIGATION

As previously stated, it is unclear what authority state or federal agencies have to require compensation of unavoidable impacts, although federal agencies have negotiated for partial compensation in some instances. However, compensation has become an accepted and increasingly common means of dealing with unmitigated losses of resources (Thompson 1979). For example, compensation of riparian habitat losses by off-site enhancement has recently been applied to several hydroelectric projects in the Northwest. The U.S. Army Crops of Engineers was required to partly compensate for inundation of bighorn sheep winter habitat by Libby Dam through purchase of sheep habitat along the Kootenai River near Kootenai Falls. Loss of whooping crane migration habitat due to construction of the Grayrocks Dam in

Wyoming was compensated by establishment of a $7 million Whooping Crane Trust Fund, the annual interest of which (an estimated $500,000) will be used to manage habitat elsewhere (Bowen 1979).

In another compensation settlement, riparian habitat lost due to inundation by the Wells Project in Washington is to be compensated by a $1.25 million program, which includes not only long-range relief from damage (restoration and off-site enhancement), but immediate interim relief as well (including release of pen-reared game birds to offset decreased availability to hunters). Overall, nearly 2,996 ha (7,400 acres) of off-site lands were made available for intensive enhancement management, as compared to losses of about 1,903 ha (4,700 acres) due to inundation (Oliver 1974).

Utilities often enter into voluntary wildlife compensation agreements, recognizing the public relations value of such programs. Pacific Gas and Electric carried out a voluntary $250,000 wildlife compensation program in connection with a pump storage project and associated transmission lines. The program included clearing wide blocks of chapparal to improve deer winter range and using sandbags to create permanent ponds in borrow areas (Burgess and Huber 1979).

Compensation has primarily been negotiated for unavoidable and quantifiable impacts on environmental resources, but future compensation plans may address social impacts that are difficult to quantify. Many of these impacts will result from short-term solutions to the nation's energy problems, and related compensation plans could be developed. For example, compensation could reflect a project's overall impact on energy-use patterns. As stated in the draft EIS, changes in energy-use patterns are inevitable, but the transition to use of other than fossil fuels must be planned. A compensation plan designed to promote this transition could include such options as helping towns develop mass-transit systems.

With its vast reserves of natural resources, Montana will be subject to continued energy development. Mitigation of impacts, including compensation, will become an increasingly importantly factor in protecting and enhancing Montana's environment.

CHAPTER FIVE

PUBLIC COMMENT ON THE DRAFT EIS

DNRC allotted a thirty-day public comment period following the release of the draft EIS. This comment period was later extended another fifteen days at public request. During the comment period, DNRC conducted ten public hearings. Approximately 550 people attended the hearings, with 104 people testifying in favor of the project and 50 people speaking against it. The names of the individuals who testified are listed in appendix B.

Testimony primarily addressed the question of need. Proponents of the pipeline cited Canada's curtailment of exporting crude, the security of having a crude-oil transportation system entirely on U.S. soil, and the dependency of the U.S. on foreign sources of energy as justification for pipeline construction. Testifiers also stated that Montana is an agricultural state and depends on diesel fuel to plant and harvest.

Some of those opposed to the Northern Tier Pipeline stated that construction of a transportation system does not guarantee a secure supply of oil. They cited federal studies that question whether there is sufficient demand for the crude and whether construction would be economically viable. Many noted the Alaskan oil reserves are dwindling quicker than was predicted and that NTPC may be forced to rely on foreign crude to operate the pipeline at full capacity. Many people stated that if the pipeline is built, there should be state monitoring of construction.

DNRC also accepted written testimony. Eleven statements for and eighteen against construction of the pipeline were received. Thirteen statements were neither for or against the project, but did comment on the draft EIS; seven of these were from state agencies. Appendix C lists the people and organizations that submitted written comments.

The magnitude of response during the public comment period precludes printing each comment and question. Therefore, the comments, including the oral testimony, were grouped by concern and similar comments summarized, as allowed by DNRC's rules implementing MEPA. Specific questions were addressed. The comments are presented below by concern; each is followed by a response from DNRC.

POLICY

Why weren't environmental assessments of the system alternatives done?

The purpose of DNRC's study was to examine potential impact of the Northern Tier Pipeline on Montana. Of the alternative proposals, Unit Train would be the only one having any possible environmental impact on the state. Since it was ranked least favorable of all construction alternatives, there is little justification for further study.

Compensation for public resources decreased or lost during construction should be available whenever mitigation is inadequate. Additionally, a fund should be established for reclamation or compensation of losses resulting from future oil spills. Since NTPC has proposed this pipeline as a short-term solution, a substantial fund should be

established from the profits to promote such longer-term solutions as conservation and mass-transit systems.

DNRC has recommended that NTPC develop and adopt a compensation plan. See chapter four.

To ensure adequate protection of environmental concerns and the rights of private landowners, the state should do centerline evaluation and construction surveillance on the entire route. A surveillance program should include state approval of NTPC's reclamation, oil-spill contingency, and quality-control plans, as well as any other plans pertinent to pipeline construction. The state should also provide private landowners with information on what is required of NTPC.

DNRC has recommended that an Interagency Pipeline Task Force be established to coordinate state involvement in granting NTPC its necessary easements and permits.

SYSTEM ALTERNATIVES

DNRC's review of conservation and other alternatives, particularly fuel switching, was limited.

The state is studying these alternatives, but it is unclear how they will affect crude-oil supply and demand.

Additional pipelines would be needed to retain all of the crude production in Montana.

It is true that some new construction or modification of existing pipelines would be needed to retain 100 percent of Montana's crude production; however, reallocation as discussed in the draft EIS could retain about 65 percent without any construction or modification.

There is no pipeline connection between Edmonton and the Rangeland Pipeline. Thus, the Trans Mountain, Kitimat, and Alaska Highway pipelines cannot be considered alternatives.

There is a pipeline connection between Edmonton and the Rangeland Pipeline. This connection (the Texaco Exploration Pipeline) currently runs north and would require reversal to send crude south from Edmonton. However, reversal would probably not be needed if Alberta crude were sent south in exchange for crude delivered to Edmonton by one of the proposed alternative pipelines.

Many comments were received concerning the security of crude supply. Many stated that Alaskan crude may not be available and the Northern Tier Pipeline may transport only foreign crude.

It is possible that the pipeline may not offer access to a secure source of crude. This is discussed in chapter one.

The possibility of using the Milwaukee Railroad to transport crude oil to Montana refineries should have been assessed in the draft EIS.

Discussion of the Unit Train alternative in the draft EIS is in many ways applicable to shipment of crude on the Milwaukee Railroad. Although many of the necessary facilities already exist, it is still a relatively expensive method of transporting oil, with considerable potential for environmental damage.

It is misleading to present worst-case crude production figures for Montana. In addition, the assumption of a constant world price of oil resulted in unrealistically high demand figures for Montana.

DNRC acknowledges that the actual situation will probably not be as severe as the worst-case. DNRC's worst-case Montana crude production and demand projections are compared in the following table to the Pace Company's most recent projections.

TABLE 2. COMPARISON OF PRODUCTION AND DEMAND PROJECTIONS

	Demand (in bpd)		Production (in bpd)	
	Pace[1]	DNRC	Pace[1]	DNRC
1980	79,900	83,300	95,000	88,600
1985	83,900	94,200	97,000	85,000
1990	94,000	103,300	100,000	70,700
2000	106,400	120,800	100,000	48,900

[1] Pace 1979

CONVERSIONS: 1 barrel = 42 U.S. gallons
1 U.S. gallon = .003785 m^3

Canadian exports have stopped as of November 1979.

This occurred after the draft EIS was published. DNRC has found that the export curtailment to Montana has been made up for by exchanges of crude. Except for a reduction of expected supplies by 4,054 m³/d (25,500 bpd) for 1980 and 1981, DNRC's analysis in the draft EIS (table 12) is not affected.

The NTPC cost estimates used in Montana's draft EIS are lower than those used in the state of Washington's EIS and do not include the cost of hookup to the Puget Sound refineries.

As stated in the draft EIS, the cost estimates used were those supplied by NTPC. The hookup to Puget Sound is not part of NTPC's proposal, but the addition of this spur line could increase the tariff charged to Montana refineries.

Why didn't the draft EIS have any analysis of national need?

An examination of national need was beyond the scope of the analysis and, in fact, would be a duplication of federal studies. For further discussion, see chapter one.

Reallocation of Montana crude and refined product would cause shortages in the areas where the crude and product have historically gone.

The possibility of disruptions in crude supply will be minimized by proposed or potential expansions of the midcontinent pipeline system. About 84 percent of the crude currently exported from Montana goes to states that have alternative sources of supply. Reallocation should not cause disruptions in refined product supply as long as Alaskan and foreign crudes are available; product shipments could be made by barge on the Columbia River to eastern Washington from refineries on the West Coast.

The taxpayers should not have to subsidize NTPC if the pipeline is not economically viable.

If the pipeline cannot secure private financing, NTPC may claim the project has sufficient social benefit to warrant federal subsidy. The most likely form of subsidy would be federal guarantee of debt. That is, the risk of financial failure and nonpayment of debt by NTPC would be transferred from lenders of investment capital to U.S. taxpayers. Because Montana contributes a small portion of the tax pool, risk transfer to Montana would be small, while benefits resulting from lower tariffs could be relatively large.

Increased electricity costs are pecuniary externalities and are not properly included in a benefit/cost analysis.

Pecuniary costs and benefits are transfers of money wealth from one segment of society to another. DNRC agrees that, in a national benefit/cost analysis, pecuniary costs and benefits should not be included because there is a zero net change. In the case of increased electricity costs in Montana caused by the Northern Tier Pipeline, there is a transfer from Montana electrical power users to users of petroleum products supplied by the pipeline. Since approximately 90 percent of the petroleum transported by the pipeline would go to states other than Montana, there is a net transfer out of Montana. This transfer must be included as a cost to Montana in a Montana benefit/cost analysis. An approximate measure of this transfer is the difference of the marginal cost of electricity and the actual amount paid by NTPC for electrical power in Montana. This is the figure used in the benefit/cost analysis.

A social discount rate of 10 percent, as used in the benefit/cost analysis, is far too high.

In the Sensitivity Analysis (see p. 45), DNRC included both a higher and a lower social discount rate. There is no difference in the results of the benefit/cost analysis with use of an 8 percent social discount rate. (Many other technical comments concerning the benefit/cost analysis were received. Response to these comments would involve lengthy and technical discussion; this information is on file at DNRC.)

ROUTES

The Lookout Pass Route should be reconsidered because it is already a heavily developed corridor.

DNRC originally considered Lookout Pass, elevation 1,440 m (4,725 ft) as a possible entry point from Idaho. Lookout Pass is 40 m (134 ft) lower than Thompson Pass and is crossed by two railroad lines and Interstate 90. However, a Lookout Pass crossing is not acceptable to the state of Idaho, because it conflicts with active mines and with congested urban areas in the Wallace-Mullan region. The mining towns along the Lookout Pass Route lie along the narrow stream bottom, which is subject to flooding and is already severely congested with railroad and highway rights-of-way.

The pipe should not be routed down Prospect Creek because:

1) **The drainage is very narrow and already congested with the Yellowstone Pipeline, three power lines, and a road**

2) The proposed route lies on the floodplain; the Yellowstone Pipeline has been damaged by floods
3) There are shallow wells along the route that could be contaminated
4) Revegetation after construction would be difficult
5) There are five faults and three earthquake epicenters near or on the route

DNRC agrees that impacts on the Prospect Creek area would be high. USFS has proposed the Driveway Ridge Route as an alternative for this area; however, the costs and construction difficulty of this alternative are so great that DNRC concludes mitigation through centerline location, surveillance, and compensation of unmitigated impact in the Prospect Creek area would be more cost-effective. See DNRC's analysis of the Driveway Ridge Route on p. 46 and the discussion of compensation in chapter four.

It is not probable that flooding would uncover the Northern Tier Pipeline, considering that the depth of burial of the pipe is calculated on the basis of a one-hundred-year flood with an additional safety factor. The Yellowstone Pipeline is shallowly buried, and the pipe is not as strong as that which would be used on the Northern Tier Pipeline. The probability of seismic damage is low; see DNRC's responses to comments on earthquake hazard for further discussion.

The Eddy Islands, east of Thompson Falls, are crossed by four existing utilities. The addition of another pipeline would not leave room for the still-valuable wildlife habitat.

The DNRC Recommended Route avoids these islands.

Individuals and local governments along the Raynesford Route urged its selection. The advantages generally cited were:

1) There are no legal constraints along the route
2) Since the route is rural, there would be little impact on urban and commercial development
3) Lewistown and other communities along the route have facilities to support construction activities
4) Impacts on the Missouri River would be less than from other routes
5) There would be less chance of oil spills
6) Impacts to wildlife would be low

DNRC agrees that impacts on urban and commercial development would be low and that communities along the Raynesford Route have facilities to support construction activities. Impact on the Missouri River would be comparable to that from NTPR and the DNRC Modification Route, as all three cross the river twice. Information regarding relative risk of oil spills on the routes is not available. Overall, DNRC has concluded that there is no overriding reason for selecting any route over any other east of Bonner. Therefore, the DNRC Recommended Route east of Bonner follows NTPR for the most part. See chapter two for a more detailed description of the DNRC Recommended Route.

Several comments suggested that the pipe be laid down the median of Interstate 90.

DNRC examined this alternative (see p. 137, draft EIS) and found that it was not possible. Federal and state highway regulations prohibit utility facilities from being placed longitudinally within the controlled access portion of the interstate right-of-way. Also, there are many places where the two lanes converge and there is no median strip. Other disadvantages include breaking up of pavement by operation of heavy equipment on the interstate and interference with traffic.

The DNRC Modification Route through Garrison and Avon is better than NTPR because feeder lines would be avoided.

It is not clear what feeder lines are being referred to in this comment. There are more existing utilities (power lines, pipelines, railroads, and highways) in the Avon-Garrison area than in the Nevada Valley and Garnet Range. However, the DNRC Recommended Route follows NTPR in this area to avoid the crossings of and close approaches to the Clark Fork and the Little Blackfoot rivers and to avoid severe construction problems in the narrow canyon of the middle reach of Ten Mile Creek.

Avoiding disturbance to wildlife and reducing the number of stream crossings are good ideas; but without field reconnaissance and analysis, they are poor parameters upon which to base route location.

The information used to base route location is adequate. It is by centerline evaluation (see p. 15) and mitigation (see appendix A) that impacts can best be avoided or reduced.

Although NTPC has been "refused permission" to cross the Flathead Reservation, the St. Ignatius Route is still under consideration. There is no indication in the draft EIS that the Tribal Council and the appropriate boards have been consulted regarding alternative corridors crossing or adjacent to Indian lands.

Discussion of the St. Ignatius Route was included because NTPC is still negotiating with the Tribal Council. If NTPC were granted permission to cross the Reservation, DNRC has concluded that the Arlee Route would be preferable to the St. Ignatius Route; therefore, the Arlee Route was also considered. DNRC held meetings with the Fort Peck and the Confederated Salish and Kootenai tribal councils regarding the Northern Tier Pipeline. The results of the meetings and subsequent correspondence were that neither council was interested in further participation.

DNRC did not map NTPC's Garrison Route from Missoula to Helena.

DNRC was in error. The DNRC Modification Route in part follows NTPC's Garrison Route. This is described on p. 133 of the draft EIS.

TERRAIN, ENGINEERING, AND HYDROLOGIC CONCERNS

NTPC has settled for a 16-m-wide (54-ft-wide) permanent easement on federal lands, but requires 23 m (75 ft) on state and private land. In western Montana, federal land would probably be steeper and require more width for construction than most state or private lands. Proof of necessity and special approval is required to extend this standard 16-m (54-ft) width. State and private lands do not have this restriction. Why?

The 16-m-wide (54-ft-wide) and 23-m-wide (75-ft-wide) rights-of-way referred to are for operation and maintenance only. For construction, NTPC has requested a minimum of 27 m (90 ft) on all lands, with additional width where required. NTPC has stated that federal ownership of the land on either side of the right-of-way precludes most types of construction close to the pipeline. On private land this protection from construction is not inherent by ownership and thus NTPC maintains that a wider right-of-way is needed to protect the pipeline. The Board of Land Commissioners can restrict construction on state lands; no governmental agency has the authority to do so on private lands. DNRC feels that in many places a permanent right-of-way width less than 23 m (75 ft) would be adequate on private land. Appropriate width of right-of-way should be determined on a site-specific basis during centerline evaluation, and during negotiations with private landowners.

A 9-m-wide (30-ft-wide) right-of-way could severely restrict maintenance or repair crews.

Normal visual inspection by air or ground patrols could be accommodated if 9 m (30 ft) of the permanent right-of-way were kept clear of shrubs and trees. The total right-of-way width would be available for a working area, but would require some clearing should reexcavation be necessary.

On table 25 of the draft EIS, each of the aerial crossing methods has listed as a disadvantage "vulnerable to damage." All crossing methods are vulnerable to damage. As stated on p. 41 of the draft EIS, "Aerial crossings have been in operation for twenty-five years and no failures have occurred to date." This appears to be evidence of a lower risk than that which DNRC has projected. Additionally, pipe-within-pipe or other encasement would greatly reduce risk of failure or damage and should be so stated. Buried pipe would be less damaging, with less chance of a spill, only if horizontal or directional drilling were used, and then only if pipe-within-pipe or pipe within another protective encasement were used.

Aerial crossings were judged to be more vulnerable to damage from outside forces because of the potential for vandalism and exposure to wind, ice, and collision. Buried crossings are just about immune to outside damage, except for earthquake and scour damage. The history of all crossing types is good; buried crossings are slightly better than aerial.

The draft EIS does not present a true picture of the magnitude of the environmental impacts that occur when large-diameter crude oil pipelines are buried beneath rivers or when those pipelines leak.

The section entitled, "Trenched Pipeline Crossings" on p. 40 of the draft EIS has been expanded. See p. 43.

The relevance of the TAPS casualties to the proposed Northern Tier Pipeline in Montana is unclear. Montana and Alaska are geographically dissimilar; furthermore, TAPS was constructed and underwent shakedown at a time when environmental safeguards, although recognized, were less stringent than currently.

DNRC does not see that the geographic location of TAPS had any influence in causing the spills described in the draft EIS. The description of these spills points out human shortcomings in design, construction, and operation; people make honest mistakes and accidents may result. It seems appropriate to point out the possibility of similar mistakes occurring on the Northern Tier Pipeline. This reinforces the need for checks and cross-checks to minimize accidents.

The risk of vandalism is described as "moderate" on table 27 of the draft EIS, yet EPA data for 1975 indicate that only 1.5 percent of all spills occurring in that year were attributable to this cause. DNRC should provide back-up data.

As noted on p. 50 of the draft EIS, average values for spill incidences cannot be applied to this pipeline, and potentials listed in table 27 are subjective to some degree. In arriving at the risk potential for vandalism, DNRC evaluated adverse public sentiment toward construction of a large oil pipeline in Montana and the potential for action as a result of this sentiment; an estimation of the risk was then made.

Table 27 states that the risk potential due to corrosion is "High; modern corrosion prevention techniques are apparently effective, but new and thus unproven." Actually, these techniques were pioneered over thirty years ago and are well proven. It was only in 1968 that USDOT began keeping leak statistics which further encouraged many pipeline companies to convert older lines (1945 and older) to the modern corrosion-protection systems. The value of petroleum and more stringent environmental regulations have also been recent encouraging factors.

Corrosion leaks have definitely been reduced through implementation of modern corrosion-prevention techniques, and table 27 has been changed to reflect this. About 10 percent of the reported leaks caused by external corrosion were in pipelines with coating and cathodic protection (USDOT 1978). Next to damage by outside forces, corrosion is the most likely cause of leaks; based on past performance, DNRC feels at least one corrosion-caused leak can be expected during this pipeline's life span.

On table 27 of the draft EIS, streambed scour should also be listed as an "activity." Risk potential is more likely low-to-moderate, and spill size is strictly conjecture.

Streambed scour should be included with earthquakes and landslides with the same spill size and rates.

Since NTPC's automatic leak-detection system is only capable of detecting 0.5 percent of throughput, a leak of approximately 556 m³/d (3,500 bpd) (at approximately 113,000 m³/d or 709,000 bpd throughput) could conceivably go undetected. If throughput were increased to 150,000 m³/d (933,000 bpd), an undetected leak of approximately 715 m³/d (4,500 bpd) could occur. The draft EIS estimates 1.4 oil spills will occur each year along the portion of the pipeline in Montana. How was this figure determined? It could be higher and thus more detrimental to Montana's environment than indicated.

DNRC agrees that large quantities of oil could be lost during a spill. The estimated number of oil spills was derived from reported leaks on liquid pipelines. Reporting of leaks has been required since 1968. Since many miles of existing lines are old, it is the concensus of pipeline-industry personnel that a spill frequency of less than 1.4 spills per year would occur. On the other hand, spill frequency has been higher than 1.4 per year on TAPS, a new line similar in size to the Northern Tier Pipeline.

DNRC's definition of a major oil spill as one greater than 794,850 L (210,000 gal) and a minor oil spill as one of less than that amount is an inadequate classification to evaluate the impacts and frequency of various-size oil spills. DNRC should use EPA's definition of a major oil spill as one greater than 37,850 L (10,000 gal) and a minor oil spill as one of less than 3,785 L (1,000 gal).

USDOT spill data pertains to spills of approximately 795 m³ (5,000 b) or more (one barrel equals forty-two U.S. gallons). Therefore, to use this reported leak information to the fullest, DNRC defined a major leak as 795 m³ (5,000 b) or more. Spills defined by EPA as minor are below the minimum spill size (7.4 m³ or 50 b) that is required to be reported by USDOT. As a result, the available data on spills would not relate well to EPA's spill-size definitions.

EARTHQUAKE HAZARDS

There have been three recorded earthquakes between Thompson Falls and Plains that ranged between 2.5 and 5.5 on the Richter scale. They are not mentioned in the draft EIS.

Map 3 in the draft EIS does not show all earthquakes in Montana. The map shows all earthquakes in the National Oceanic and Atmospheric Administration (NOAA) computer data file, including all instrumentally (seismographically) located earthquakes in Montana. Unless an earthquake exceeds magnitude 3.5, it would probably not be instrumentally located (at least, not in Montana) and, therefore, would not be in the NOAA computer file. DNRC also examined records of earthquakes which have only been reported as "felt," but no significant earthquakes in the Thompson Falls area were found. The University of Montana seismograph network recorded two small earthquakes in the Thompson Falls area from 1974 to 1976.

Not all earthquake faults are shown on map 3 in the draft EIS. For example, there is a fault in the Prospect Creek-Thompson Falls area that isn't shown on the map.

This is true. There are many more faults in western Montana than are shown on the map. Only faults that are thought to have been active within the last twenty-six million years are shown. The faults shown whose ages are "uncertain" are probably younger than twenty-six million years. The faults shown on map 3 (among others) have been studied by geologists in moderate detail. It is possible that trenching across these faults could yield new estimates of their age. It is also possible that future geologic studies will reveal more "young" faults along the pipeline route.

The proposed pipeline is not earthquake proof, but yet would be built within 16 km (10 mi) of many major faults, including two in the Helena Valley.

An earthquake usually does not produce offset on the fault near the surface. Most earthquakes in western Montana are initiated at depths of 5 to 15 km (3 to 9 mi). Presently, it appears that earthquakes with Richter magnitudes exceeding about 6.5 may be expected to cause fault displacement near the surface. This could vary with the geologic environment in which the earthquake occurs. This is important because experience indicates that pipelines withstand a considerable amount of shaking (see **Northern Tier Report No. 4**), and that the main hazard to the pipeline is from fault offset. Experience also shows that damage can occur from landslides induced by earthquake shaking (or any other cause) if the pipeline is buried in material that slides. Earthquake shaking can also be expected to cause damage to above-ground pipeline facilities if the shaking is strong enough.

Hasn't movement under the earth increased in recent years?

There is no evidence that the rate of earthquake occurrence has changed significantly in this century.

The Hope and Ninemile faults, as well as subsidiary faults in the Ninemile area, pose a real threat to the pipeline.

The probability that a large earthquake (magnitude 6 and above) would occur on either the Hope or Ninemile faults during the lifetime of the pipeline appears very small. However, geologic investigation of a preliminary trench across the Ninemile Fault may be advisable.

Faults that have shown recent (last ten thousand years) movements at the surface have not been identified along the pipeline route.

This is correct. However, there have been few detailed geologic studies.

Is it true that pipelines can withstand earthquake disturbance on the order of the recommended "credible" earthquake (Richter magnitude 6.5 to 7)?

This seems correct for the pipe itself, providing it is not affected by fault offset or induced landslides. The Earthquake Risk Group of the U.S. Geological Survey has recently tentatively concluded that geologic structures in the Helena region and further south could produce a credible earthquake of Richter magnitude 7.5 (1979); however, the rate of occurrence of such earthquakes appears very minimal.

Comparison of past earthquake effects on water and sewer lines to potential effects on the proposed Northern Tier Pipeline was not appropriate.

It is true that the proposed Northern Tier Pipeline is of a more modern design than the water and sewer lines studied. However, DNRC wished to examine the effect of fault offset, landslides, and shaking on pipelines during large earthquakes. Presumably fault offset and landslides could cause failure of the Northern Tier Pipeline if it were not properly designed.

The use of the Schnabel and Seed curves (1973) for determining ground accelerations near earthquake faults (in *Northern Tier Report No. 4*) is not appropriate in Montana.

It seems prudent to use the Schnabel and Seed curves (which are actually conservative compared to some recent estimates) until more data are accumulated.

Historical data given in *Northern Tier Report No. 4* do not agree with projected recurrence rates of large earthquakes.

The number of historical earthquakes is in reasonable agreement with the projected data, considering that earthquake data are complete at the magnitude 5 level for only the last nineteen years. At magnitudes 6 and 7, the data are complete for fifty-three and seventy-eight years respectively (see p. 15, **Northern Tier Report No. 4**).

In table 6 of *Northern Tier Report No. 4*, least squares regression would be a better method than the use of graphical techniques to estimate earthquake recurrence rates.

Least squares regression did not yield significantly different results. In determining recurrence relations, low weight was given to cumulative numbers of earthquakes at low magnitudes and at high magnitudes. The former data are incomplete because of the limited detection capability of seismographs in the region, and the latter data are considered statistically unreliable since the numbers are small. Blind application of linear regression to all the data would have erroneously overestimated the number of large earthquakes expected.

ELECTRICAL SERVICE

MPC assumes a generation availability of 75 percent rather than the 65 percent assumed by DNRC.

DNRC feels 65 percent may be more appropriate for coal-fired units. The use of a 75 percent availability factor would mean that 114 to 120 MW of additional generating capacity would be required to serve Montana pump-station loads, rather than the 132 to 139 MW stated in the draft EIS.

Actual reliance on coal should be calculated on 70.1 MW from MPC rather than 96.2 MW. The balance of 26.1 MW is served by the McCone Electric Cooperative which is served by BPA and the Montana-Dakota Utility Company.

Coal-generation figures presented in the draft EIS refer to Montana as a whole, not to loads that would be served by MPC. Load growth east of the system break is generally being met through new large coal-fired generating plants constructed by the Basin Electric Cooperative or by private utilities, not by BPA.

Expansion of coal-fired generation will increase acid rains, which will destroy all life in numerous lakes.

DNRC did not study environmental impacts of electrical generation for this project.

The draft EIS fails to address the impact of higher electrical rates on low-income residential users.

Given the assumptions in DNRC's analysis, average electricity bills would increase from approximately 6 to 8 percent. No detailed estimates could be made of the effect on family budgets.

NTPC should be required to pay full marginal costs of electric power for the pump stations.

The Public Service Commission is charged by the Public Utility Regulatory Policy Act (1978) with consideration of alternate rate structures, including rates based on marginal costs. A marginal-cost-based rate is one which reflects the cost of providing additional energy to a given type of customer. It includes the cost of new generation, plus incremental transmission distribution and customer costs. Rates reflecting marginal costs are necessary to prevent inequitable shifting to others of costs such as those described in the draft EIS.

Switching to a rate structure based on marginal rather than average costs would not necessarily raise electricity bills. A uniform charge per kilowatt hour (kwh) based on marginal costs would yield revenues in excess of those allowed to regulated private utilities or those needed by public utilities. This could be dealt with either by a block rebate to all customers or by a lifeline-type rate. For example, assume an average-cost rate for residential customers was $.03 per kwh plus a $3.00 per month customer charge, and an average household consumed 600 kwh per month. If the marginal cost for residential customers was $.052 per kwh, a marginal-cost rate might be $.052 per kwh minus a $10.20 rebate per month. If consumption were unchanged, the monthly bill would be $21.00 under either rate. An example of a lifeline-type rate that would have the same effect, would be $.0172 per kwh for the first 250 kwh per month, then $.052 per kwh for all consumption above 250 kwh.

If overall consumption went down, there might have to be an adjustment to the block rebate in the short run to meet revenue requirements. In the long run, costs would be lower under a marginal-cost rate, because reduced load growth would require fewer expensive new facilities. Furthermore, marginal-cost-based rates would result in each user paying for his or her own consumption of electricity; there would be no shifting of costs to other users, as occurs with average-cost rates.

DNRC believes that because of the inequity of shifting part of the pumping costs of NTPC to other electricity consumers, the Public Service Commission should consider a marginal-cost-based rate for electrical service to new large users, such as NTPC, until there is a complete revision of rates. The Commission should weigh the inequities associated with an average-cost rate against any arguments of discrimination in singling out a particular type of customer.

LAND USE

On rolling hills, such as is in most of western Montana, NTPC would cut and fill to construct the required 23-m-wide (75-ft-wide) level right-of-way through fields. This would make farming difficult if it were not returned to its original grade. Setting sprinkler pipes would be impossible, and spring runoff and weed control would present problems.

NTPC proposes to return the land as close to its original grade as possible. Concerns such as weed control and sprinkler pipes could be addressed in easement negotiations with NTPC.

Tables 28 and 29 of the draft EIS appropriately cross-reference areas delineated on map 5. The list of sixteen areas on map 5 do not all coincide with the areas listed on tables 28 and 29.

The areas do coincide.

Is the reduction of productivity referred to in paragraph four, column three, on p. 55 of the draft EIS, short term or long term? If the land were reclaimed, wouldn't productivity be restored?

As stated, "If fields were restored to level, water systems repaired, topsoil replaced, and noxious weeds controlled, there would be no major long-term impacts except for those from possible oil spills and maintenance activities." Consequently, the reduction of productivity is expected to be short term.

In reference to paragraph six, column one, on p. 56 of the draft EIS, which public services would be impeded? Public utilities can be located under or over a pipeline.

The statement is made that public **services** could be impeded because USDOT regulations do not allow structures to be placed over the pipeline. It is not anticipated that public **utilities** would be impeded.

NTPC's insistence of a 23-m-wide (75-ft-wide) permanent right-of-way on private land indicates that the company is anticipating breaks, countering its claims of reliability. This width is excessive and places unwarranted restrictions on private use of the land (for example, subdivision). A right-of-way width of 9 m (30 ft) is recommended.

DNRC has recommended that width of the permanent right-of-way in areas identified during centerline selection be reduced to mitigate land-use restriction or other impacts.

Sites less than 65 ha (160 acres) were not considered in route selection, and the types of sites that DNRC considered critical were not well defined. An obvious oversight are numerous subdivisions.

Sixty-five ha (160 acres) was the arbitrary cutoff between "areas," which are important to route selection, and "sites," which are best dealt with during centerline selection. At the mapping scale of 1:125,000, a square one-quarter-inch on a side would equal 65 ha (160 acres). In most cases, a level of resolution finer than this was not possible during the statewide mapping due to time constraints. Therefore, it was decided to defer consideration of site-specific situations until a final route was selected and centerline evaluation could begin.

NTPC construction would establish a new utility corridor that would eventually be used by other utilities and result in additional impact.

It is possible that if NTPC's corridor were established, other utilities may want to site facilities adjacent to the right-of-way. The Board of Natural Resources and Conservation and the federal government favor multiple use of corridors. Any cumulative impact of multiple use of the pipeline corridor cannot be determined at this time.

A public education program should be established to provide information to landowners so they may negotiate adequate settlements for loss of land and compensation for damage caused by construction and oil spills. This information should include the effect the pipeline will have on land values.

See chapter three.

Revenues or losses of revenues to local governments are not addressed in the land-use section of the draft EIS.

Revenues are discussed on p. 62 of the draft EIS and in **Northern Tier Report No. 6**. It is expected that any revenue losses due to reduced property values would not be significant.

Who would compensate landowners for crop losses due to construction?

NTPC.

SOCIAL AND ECONOMIC CONCERNS

DNRC's suggested use of construction camps as a mitigating measure contradicts the finding of the Public Attitude Assessment Program (PAAP) that community leaders do not favor the use of camps.

DNRC recognizes that owners of rental housing and local businesses would benefit from housing workers in existing local facilities. However, in communities with limited facilities, the resulting disruption would more than offset the benefits to particular individuals. A number of comments questioned the nature of PAAP and the validity of the survey results. The purpose of PAAP was to ascertain the range of public attitudes and to determine what people foresaw as impacts of pipeline construction. DNRC did this to ensure that any problems or items of major interest were not over looked. (DNRC also participated in many meetings early in the EIS process to talk with private citizens about their concerns regarding the project.) Two surveys were undertaken, one of county leaders and one of community leaders. Neither was a random sample of public opinion and the results do not represent public opinion. Sampling procedures were designed to select potentially affected counties and communities. The questionnaire was openended, designed to elicit suggestions from the respondents rather than to determine statistical validity. Further details on methodology and results are available from DNRC.

Why are reduced crop and rangeland productivity called "losses" when they will be compensated by NTPC?

DNRC pointed out in the draft EIS that productivity would be lost during construction, and that compensation would be negotiable between NTPC and the landowners. These losses were not included in the benefit/cost calculations.

DNRC refers to "less than fifty direct permanent jobs" in one section of the draft EIS, and states the number is "nearly sixty" in another section.

The numbers of permanent employees actually involved in pipeline operation in Montana would be less than fifty (NTPC estimates 48). DNRC estimates that an additional seventy jobs in Montana would be induced by pipeline operation. Of the total estimated 120 permanent jobs, about half of them would go to Montana residents. Total permanent employment for Montanans would therefore be "nearly sixty."

Estimates of permanently cleared forest land are inaccurate, since the cleared right-of-way would be 16-m-wide (54-ft-wide) rather than 23-m-wide (75-ft-wide) in national forest land. The total permanently cleared land will be 539 ha (1,331 acres) rather than 589 to 773 ha (1,455 to 1,910 acres).

The estimates presented by DNRC were based on a 23-m-wide (75-ft-wide) right-of-way to provide consistency among the alternative routes.

Why are lengths of sections based on land-use totals rather than on NTPC estimates?

Land-use totals were used to provide consistency among the route alternatives.

If 39.6 percent of the gross payroll is going to be spent out of state (and therefore out of county), it is misleading to use the sum of induced income and gross payroll to estimate income impact on counties. This is true particularly since 39.6 percent of gross payroll is subtracted from the state total in other calculations.

The total indicates expected income received in the county. Only a small fraction of the gross payroll would go to county residents.

Some note explaining the calculation of the weighting factors would be useful.

The formula explaining the calculation of the weighting factor was:

$$\frac{\text{Miles in county x pipe diameter in county}}{\begin{array}{c}\text{(Miles of 42''-diameter pipe x 42'')}\\ +\\ \text{(Miles of 40''-diameter pipe x 40'')}\end{array}}$$

There is no estimate of lost agricultural production from crops, range, or forest that would occur from taking the pipeline corridor out of production.

Estimates of lost crop, forest, and range lands can be found on pp. 78 and 79 of the draft EIS. Estimates are also given in table 42 of the draft EIS.

Several comments indicated that there would be major road-maintenance costs. These costs should also be given.

No estimates were prepared by DNRC on the costs of damage to roadways. The federal final EIS (USDI 1979c) on the project made the following statement:

"Heavy truck traffic would probably cause some road damage near storage yards and pump stations. This impact is most likely to occur during the spring thaw period of April and May within Montana, North Dakota, and Minnesota, when roads are most susceptible to damage. Estimates indicate that approximately 1,200 tons of equipment and materials would be required to construct each pump station. For the pipeline, approximately 17,400 tons (based on six-week pipeline spread requirements) of equipment and material, not including pad sand and spoils, might be transported over some roads and highways. Based on highway weight, width, and length limits within the five states, an estimated 165 special permits per pipeline spread might be needed (NTPC 1978). It appears, therefore that there would be potential for significant road damage. In mountainous areas many of the existing roads proposed for use would require substantial reconstruction to allow the transport of pipe in forty or eighty foot sections. Widening of some roads might also be necessary. For example, construction activity would effectively close the Siegel Creek road for a period of two weeks to one month."

License fees and fuel taxes do not reflect normal maintenance costs for additional wear and tear on the roads, and state law limits mileage rates for road improvement. NTPC should be required to maintain roads damaged by the project.

DNRC agrees. State and county highway departments could include repair of roads as a permit condition. However, enforcement of such a condition would be difficult.

Several comments were received indicating that DNRC did not count the benefits of additional jobs.

These benefits were included in chapter six of the draft EIS.

Such a wide range of estimates of electricity costs and property taxes are presented that the numbers cannot be used to make intelligent decisions.

Although based on broad estimates, an analysis of the costs and taxes provides useful information for the permitting agencies.

DNRC underestimated the number of people working on the pipeline in Montana.

DNRC's estimates of peak employment are based on information provided by NTPC and were confirmed by DNRC's engineering consultant. Details of scheduling construction and the monthly work force on each section, pump station, and delivery facility can be found in **Northern Tier Report No. 6**.

DNRC did not address the effects of shutting down one of the Billings refineries because of a lack of crude.

DNRC found that there are alternatives for supplying crude to the Billings refineries. These are discussed in chapter four of the draft EIS. DNRC did not examine the impacts on Montana if one of the refineries did in fact close.

NTPC would reduce property values on the lands through which it passes.

Negotiations for easement payments between landowners and NTPC should consider any effect on property values.

Any burden on schools and hospitals during construction would be assumed by the local population, since the construction workers wouldn't pay property taxes.

Some school districts having an influx of pipeline workers' children would not receive any property taxes from the project, and others would receive the revenue after the impacts were over. In these districts, there may be additional tax burdens on local taxpayers. Hospitals are not usually funded from taxes and are generally able to pass on their costs to patients and health insurance companies. There may be a nonfinancial impact on current residents in rural areas due to crowding, longer waits, and lower service levels.

Governmental health and safety regulations may make it difficult to expand transient housing facilities.

The approval process for temporary facilities, while somewhat cumbersome, can be accomplished in sixty to ninety days by local planning boards. While this process might be hastened, DNRC does not feel it is currently a barrier to construction of facilities such as campgrounds and trailer parks.

A function of social-impact assessment is to provide the public with information needed to choose between policy alternatives. The Public Attitude Assessment Program (PAAP) did not do this.

PAAP was not a social-impact assessment.

The survey of pipeline construction workers (Mountain West 1979) and PAAP pertained to small-diameter pipelines. The results of these surveys cannot be extended to the Northern Tier Pipeline, which would be more like TAPS and would attract large numbers of job seekers.

The projects studied were smaller—the largest one was the Peace River Pipeline, which was a 76-cm (30-in) line, with 170 workers per spread. These projects were studied to determine the nature of the construction crews and the 170 workers per spread. These projects were studied to determine the nature of the construction crews and the types of impacts. DNRC does not believe the Northern Tier Pipeline would be comparable in social and economic impact to TAPS. The NTPC line would be smaller, the work force smaller and not as stationary, the construction sites more accessible, and working conditions considerably less severe. Job seekers would go to the larger cities—Missoula, Helena, Butte, and Billings—where the hiring would be done.

What would happen to the work force during the winter if the construction schedule stretched into a second year?

The survey of pipeline construction workers (Mountain West 1979) indicates that most of the nonlocal workers on pipeline projects have permanent home bases that they return to between jobs. However, in the event that workers stayed in Montana over the winter, they would probably be eligible for unemployment insurance. If they were hired in Montana, their payments would be charged to Montana; but if they came with the contractor, payments would be charged to their home state. Most workers would probably be ineligible for state economic assistance if they were collecting unemployment insurance or if they had assets greater than two automobiles plus $1,500.

A proper social-impact assessment must include first-hand accounts of the social and cultural aspects of the communities involved, as well as an analysis of values and how the people believe they will be affected. This was not done.

DNRC agrees that these things are important, but decided that the temporary nature of construction impacts and the low level of impact during operation did not justify the high cost of doing a proper social-impact assessment of the communities along each route studied.

It may be a strain on local authorities to enforce regulations, especially if construction workers park their campers and motor homes at any convenient spot.

DNRC has recommended that funds be provided for additional law enforcement personnel where appropriate (see p. 50).

The draft EIS should have identified the impacts on existing community services, particularly in towns with populations of less than 2,500.

This was done. The information is contained in **Northern Tier Report No. 6**.

What danger is associated with storage facilities? What mitigation is proposed?

DNRC identified fuel-storage facilities at construction spreads as the greatest source of fire danger. OSHA fire-protection rules and standards would have to be adhered to. Mitigating measures to minimize fire danger are listed in appendix A.

The difference between the Northern Tier Pipeline and a nonconstruction alternative are greater than shown in the draft EIS because (1) electricity rates are rapidly rising while tax payments are fairly stable and (2) taxes would be lost if the Glacier Pipeline is abandoned.

The level of electricity rates was not a key element of DNRC's benefit/cost analysis; only the difference between the average-cost-based rate and the marginal cost of new generation was considered. Both of these have been rising. DNRC feels it is unlikely that the Glacier Pipeline will be abandoned, as it is used to carry Montana crude from the northern and central Montana fields to Billings.

According to the federal EIS, electrical power requirements would represent a 1 percent increase in total electrical demand over the entire Northwest, but would increase BPA's system deficits by 5 per-

cent. Montana may be required to supply these shortages.

If electrical loads on the full Northwest segment of the pipeline were met by mine-mouth coal-fire generation in Montana, the coal-use projections and the air- and water-quality impacts of coal-fired electrical generation presented in the draft EIS would be low.

CULTURAL RESOURCES

Both the Federal Historic Preservation Act and the Montana State Antiquities Act are limited in their application to federal and state lands. Outside of state and federal lands, only those heritage properties, paleontological remains, and other properties placed on the National Register of Historic Places are covered by the Federal Historic Preservation Act or the Montana State Antiquities Act.

USDI recently initiated a policy that all nonfederal lands are subject to survey as provided for by the Historic Preservation Act.

SOILS

NTPC is committed to tilling the compacted areas after construction.

DNRC acknowledges this. However, tilling as proposed by NTPC may not completely reverse the compaction caused by construction. References documenting this conclusion are presented in the draft EIS, p. 67, and in **Northern Tier Report No. 1**.

The Garnet Range area surrounding Helmville has high erosion potential. Aerial views reveal severe contributory effects from off-road vehicular use. Much of this land is of fragile quality and has been recently overgrazed.

DNRC agrees that the Garnet Range area near Helmville has high potential for erosion associated with construction. The draft EIS categorized NTPR as having "high erosion potential" from the south end of the Potomac Valley (near the Copper Cliff Mine) eastward to a point just south of the Nevada Creek Reservoir. Not mentioned in the draft EIS are local steep areas of erodible soils in the Garnet Range that would result in extremely difficult problems during reclamation. This area perhaps should be classified as "critical" rather than "sensitive." (These terms are defined in the Glossary of the draft EIS.)

AQUATIC LIFE AND HABITAT

DNRC's use of the terms "major" and "minor" when referring to stream crossings implies basis for subjective judgments that do not exist in regard to aquatic resources. Relegating stream crossings in rivers such as the Smith, Blackfoot, and Clark Fork as "minor" may seem almost sacreligious to Montanans who have enjoyed the beauty and recreational values of these waters.

As used in the draft EIS, these terms have meaning only from an engineering standpoint and indicate the relative difficulty of crossing a stream. DNRC has tried to eliminate their use in references to biology or recreation.

Hydrostatic testing is mentioned as having possible adverse impacts, but the analysis is lacking. After reading all the data included on the subject, questions can still be asked: Where will the water come from? In what amounts? At what times? Where will it be dumped? In what conditions? At what times and in what amounts? These are serious questions that should be answered before a full evaluation of this subject can be made. Granted, there is a list of mitigating measures that would decrease real and potential adverse impacts; but specific testing method evaluation and impact analysis are insufficient.

Detailed plans for hydrotesting by NTPC cannot be done until a centerline has been selected. DNRC and DHES would both have permitting authority over this activity.

In the list of mitigating measures on p. 76 of the draft EIS, (6) should be changed so that "tested for impurities" reads "tested for chemical and biological impurities." The potential, albeit very small, does exist for the transport of detrimental organisms from one watershed to another. Two specific examples include the potential for transport of *Ceratomyxa spp*. from the west side of the Continental Divide to the east, and transporting large-enough populations of macro- or microinvertebrates from one watershed to another to significantly alter their distribution and thereby affect species farther up in the food chain.

DNRC agrees. The mitigating measure has been changed.

The aquatics section should have included a discussion of the potential effects construction camps could have through legal and illegal harvest of nearby fish and game species. Legal rates of

harvest could increase greatly. Couple this with some level of illegal harvest, and it is easy to believe that tremendous pressure would be put on fish and wildlife populations. The work-load increase and associated problems for law enforcement officers would also be significant.

This issue was addressed briefly in **Northern Tier Report No. 3**. The risk of depleting fish and game populations would be reduced by the fact that these workers would likely be working six ten-hour days a week. There is no doubt however that this is a potential problem. DNRC has recommended that additional funds be made available for law enforcement.

DNRC's discussion of increased power demands was inadequate. Depending upon which sources are used to meet these increased demands, the demands pose a significant long-term threat to fish and wildlife. One possible alternative would be the use of gas turbine pumps powered by burning off light fractions—a method used on TAPS.

DNRC agrees that future energy development could have long-term adverse impacts on fish and wildlife. Alternative methods of powering pump stations are discussed on p. 46.

Some of the mitigating measures for impacts to aquatic resources need strengthening. As recommended, an aquatic biologist and hydrologist should be present during centerline evaluation to give technical advice that would protect aquatic life and habitats. However, being present and having authority to make the changes that are needed are not necessarily one and the same. Authority must be granted by prior agreement or a set of stipulations before these, or any, advisors would have any significant effect. A recommendation for such stipulations is needed. The mitigation states that adverse impacts could be reduced if any debris that may accidentally fall in waterways during right-of-way clearing were removed immediately. On the surface this appears to be a good recommendation; but, for instance, if a bulldozer or other piece of heavy equipment were to remove the debris by entering the stream and dozing it to the side, both the streambed and bank could be damaged extensively. A method for removal that would not disturb aquatic habitat, such as placing a cable around the material and winching it to the bank without entering the channel or disturbing the bank, is a much preferred mitigation recommendation. The mitigation referring to material sites is totally inadequate for the potential magnitude of effects resulting from this phase of construction. Special Report No. 13, *Environmental Surveillance of Gravel Removal on the Trans-Alaska Pipeline System with Recommendations for Future Gravel Mining* (Burger and Swenson 1977) states, "Stipulation violations did occur...the majority were concerned with gravel removal from floodplains. The most frequent problems were associated with entrapments or obstructions to fish passage, siltation of spawning beds and other fisheries habitat, and disturbance of natural waters." The possibility would seem very high that similar violations could be expected during the construction of Northern Tier Pipeline. Additional problems could result from material pits or piles that were placed on the floodplain and which were then caught by changing stream channels; these could even become the catalyst for channel changes.

DNRC agrees with these comments in general, and the ideas have been included in DNRC's recommended mitigation (see appendix A). Access to gravel would not be as much of a problem in Montana as it was in Alaska because (1) much less gravel would be required because there is no tundra, which required extensive buildup for construction to proceed, (2) more gravel is readily available that is away from active stream channels and (3) the Northern Tier Pipeline would require less road construction. Excavation of gravel in or near active stream channels should be avoided.

The following mitigating measures were suggested.

1) **Hydrostatic test water pumped from one watershed to another should be held in ponds and tested for chemical and biological impurities before reentering a natural water system.**
2) **Directional or horizontal drilling or aerial crossing techniques should be employed, wherever possible, rather than trenching across streams. For additional protection against oil spills at these extremely sensitive areas, pipe should be placed within pipe or other outer protective encasement.**
3) **Construction and maintenance roads should use clear span bridges wherever possible and practical. Where bridges are impractical, adequately sized culverts placed on-grade 0.2 m (0.5 ft) below the natural streambed should be used.**
4) **Material sites should not be placed in the floodplain.**

All hydrostatic testing water (not just that transferred from one watershed to another) should be tested for chemical impurities and have any impurities removed before reentering a natural water system. Because of the high cost, directional and horizontal drilling should only be used to cross biologically sensitive streams (as determined by DFWP). These suggestions are included in the mitigating measures listed in appendix A.

It is reasonable to assume that impacts from increased turbidity and sedimentation would be very short in duration. Special stipulations for proper timing and reclamation would reduce these impacts substantially.

Much of the fine-grained sediment settling out downstream from crossing sites would be resuspended during periods of high flow and washed far downstream until it escaped any currents. DNRC agrees that, with adherence to special stipulations, proper timing, and restoration, sediment impact would probably be short term.

There will be severe impact on aquatic life and habitat in Siegel Creek if NTPR is followed. USFS's report, *Environmental Assessment on the Northern Tier Pipeline Proposal and Alternatives in the Siegel Mountain Area*, (USDA 1979a) should be considered in the final EIS.

See the discussion of this area in chapter two.

The draft EIS lists only thirteen stream crossings in the Ninemile-Frenchtown area, while the USFS report lists from forty-seven to fifty-eight stream crossings in the same area. Why was Sixmile Creek not on map 6?

Only those streams that currently have a DFWP ranking of 4 or better were shown on map 6. The DFWP classification will continue to be adjusted as more information is gathered. Since the draft EIS was compiled, Sixmile Creek has been evaluated and given a 4 rating. It should be pointed out that the 4 ranking is now defined as being of moderate fishery value, rather than of limited value as stated in the draft EIS. It is likely that other fisheries streams on the routes have been overlooked. These could be identified during centerline evaluation.

It is very unlikely that hydrostatic test water will have any oil in it. The whole concept of impact on aquatic environments from oil contamination is one of conjecture. Predicting the probability of a spill of any size is a guess at best. Specific impacts of oil contamination on aquatic organisms is also very difficult to assess. The tone of the EIS should be such that a bleak picture of destruction and waste is not portrayed without qualification.

High concentrations of oil (hydraulic fluid) have been documented in the hydrostatic test water discharge of other large pipelines (**Northern Tier Report No. 3**). This occurs because the internal mandril of the pipe bending machine is hydraulically operated. Hydraulic lines commonly leak, and it is cheaper to replace fluid than to make repairs. The fact that petroleum products are harmful to aquatic systems is not conjecture (**Northern Tier Report No. 3**). Predicting the occurrence of modern pipeline leaks is difficult, but DNRC stands behind the oil spill risk analysis on p. 50 of the draft EIS and believes that oil leaks would be likely during the life of the project. Construction-related oil spills are likely on any large project. DNRC agrees that the specific impacts are difficult to assess, but believes the petroleum pollution section presented in the draft EIS gives a realistic view of what could happen in the event of oil spills.

The statement, "some of the most highly regarded trout streams ...are in western Montana," in the first paragraph on p. 68, should be stricken; it leaves the impression these streams will be subject to major impacts from pipeline construction and operation.

This statement was made in regard to all considered routes and is correct. Some of these streams would be subject to major impacts from pipeline construction and operation. All wild trout fisheries are increasingly valued nationwide because of scarcity and should be preserved. Western Montana is one of the last bastions of such fisheries.

Considering the width of the right-of-way, timing, special stipulations, and current state-of-the-art technology, it is unlikely that a stream's equilibrium, channel gradient, water velocity, or pool frequency would be affected to any measurable extent by pipeline construction.

Even with enforceable stipulations, streams such as Prospect, Siegel, Sevenmile, and Blanchard creeks would be likely to undergo a great deal of measurable change. In addition, even with current technology, culverts are often improperly installed and are a constant maintenance problem; as a result, the stream factors mentioned could be affected.

The draft EIS presents an unjustified "worst case," rather than a realistic scenario of impacts on aquatic life and habitats.

DNRC does not believe that a worst-case scenario is presented but, rather, that the draft EIS describes a range of impacts that would likely occur, particularly if recommended mitigation were not adhered to.

Directionally drilling the crossing of the Missouri River implies preference to NTPR. This is a premature determination of the best stream crossing method.

NTPC has indicated that it may be possible to directionally drill the two Missouri River crossings. This is the only Montana river where directional drilling is suggested as possible. Directional drilling is DNRC's preferred crossing method where feasible. It would result in little or no adverse impact to the Missouri from the standpoint of aquatic resources.

The relationship between number of stream crossings and impact on aquatic life is not direct. Impact to one stream may far outweigh the impact to several others.

DNRC agrees and considered many other factors in route comparison (p. 100, draft EIS).

It should be noted that even if all of the mitigating measures listed in the draft EIS are followed, impacts on aquatic systems would be reduced but not eliminated. The heroic assumption made in the summary of the EIS that "Properly chosen mitigating measures, if conscientiously adhered to, would prevent long-term impacts on aquatic life and habitats" is misleading. While the statement is technically correct, the history of TAPS indicates that there are no grounds for making such an assumption. TAPS had a comprehensive list of mitigating measures, but despite active government surveillance, those measures were by no means "conscientiously adhered to." In view of this, the most important mitigating measure for all adverse impacts due to the Northern Tier Pipeline would be to require forceful and rigorous involvement by government agencies in both centerline decision-making and surveillance. The DNRC centerline proposal should be supported in this regard. It is imperative that biologists, rather than engineers alone, have stop-work authority during construction surveillance.

DNRC agrees that a biologist and engineer should have equal say in surveillance activities, but this will depend on the legal authority of the state agencies. See chapter three for further discussion.

The impacts resulting from material sites should be dealt with more completely, and the list of possible mitigating measures should be expanded to include many of those listed for stream crossings and right-of-way construction. During construction of TAPS, trenched stream crossings and material sites were major causes of damage to aquatic streams.

NTPC proposes to use only existing commercial sites for gravel. Even if new sites were required, there probably is adequate gravel available away from active stream channels. DNRC agrees that many of the measures for stream crossings would apply to material sites in floodplains.

There would be from forty-seven to fifty-eight streams and from five to nine resident fisheries crossed in the Ninemile area alone. This high density of crossings increases the probability of stream damage from both construction and oil spills.

The Ninemile Creek drainage is an area of particular concern along the pipeline route. The potential for adverse impacts is high. See chapter two for a description of the DNRC Recommended Route in this area.

Trenched crossings should only be used as a last resort or where it would not otherwise affect aquatic biology. Most importantly, DNRC should work with DFWP to set up a program for wildlife habitat compensation through enhancement and acquisition of adjacent habitat where unmitigated losses do occur.

Crossing techniques and mitigating measures would have to be decided on a site-specific basis. Directional and horizontal drilling would frequently either be not feasible or the added cost would not be warranted if trenched crossings were adequately mitigated. See chapter four for a discussion of compensation.

In light of the disruption that sedimentation and oil spills would cause to aquatic life, the Northern Tier Pipeline is a threat to South Dakota's scarce water resources. Effects on South Dakota water would come from depletion of and damage to the Missouri River and its tributaries in Montana and North Dakota.

It is possible that South Dakota's water could be affected by the pipeline.

The draft EIS states, "The minimum-sized oil leak that could be detected automatically by NTPC's

proposed leak-detection system would be approximately 55 m³/d (3,500 bpd)." This is a very large amount of oil warranting a more sensitive leak-detection system.

DNRC agrees that a leak of 55 m³/d (3,500 bpd) would amount to a large spill. However, NTPC proposes to use a combination of four automatic leak-detection systems that are state-of-the-art. Trying to use these systems at a more sensitive level would result in many false alarms and possibly even unnecessary shutdowns, which would place stress on the entire system. NTPC may eventually refine the system to detect leaks smaller than 0.5 percent of volume. Aerial and ground surveillance would have to be relied on for detection of smaller leaks.

On p. 69 of the draft EIS, the following statements are contradictory and should be changed:
Paragraph 5-"There would probably be no long-term toxic effects."
Paragraph 5-"While these heavier compounds are not as toxic as the aromatic compounds, they can adversely affect aquatic life over the long term."
Paragraph 6-"Generally, oil is still detectable after a year in the area of a spill."

The statements are not contradictory. Statements in paragraphs five and six are referring to heavier compounds in the oil that are not toxic, but that can be otherwise impacted as listed earlier in the section on petroleum pollution.

Because of the nature of the blasting compound, toxic effects from nutrient pollution can occur. This is not addressed in the draft EIS and should be.

Information on the type and amount of explosives NTPC proposes to use is not yet available, but blasting could release nitrates into the aquatic system. Nitrates increase algae growth in downstream areas, and could encourage eutrophication in sluggish waters having little flushing capacity. However, extensive blasting would only be required in large rivers, such as the Clark Fork, that would also have a large capacity to dilute any nitrates produced by blasting.

GROUND WATER

Construction of the pipeline in the hills north of Missoula could destroy ground water.

Ground water could be contaminated in the hills north of Missoula, along either NTPR or the DNRC Recommended Route; however, there would be little chance of it being entirely destroyed. For the most part, the DNRC Recommended Route runs just north of Interstate 90 and, thus, traverses the base of the hills. Centerline evaluation could outline those areas particularly susceptible to ground-water contamination. NTPC (1979a) states that "Critical [ground-water] areas will be identified in the [Oil Spill Contingency Response] Plan." This would reduce but not eliminate the risk of contamination.

NTPC proposes to bury the pipeline in shallow waters in the Prospect Creek area. If the pipe were to leak, ground water and wells would be contaminated.

It is probable that ground water, as well as surface water, would be contaminated. Wells could be contaminated if the local flow of ground water were toward the wells or if the leak were close to the wells. The risk of serious contamination, however, is much greater for streams than it is for ground water. Adjustment during centerline evaluation may reduce the risk to ground water in the Prospect Creek area. Serious problems could occur if a flood were to uncover and damage the pipe; DNRC has reviewed NTPC's preliminary flood calculations and has concluded that the proposed depths of burial are adequate for protection from floods.

The Helena Valley ground-water aquifer currently provides at least six thousand people with potable water. This does not include all of the irrigation and livestock watering that is provided. A "small" leak could possibly amount to tens of thousands of barrels of oil that, because of the porous nature of the soils, might not surface and be detected. Ground water in the Helena Valley fluctuates as much as 2.4 m (8 ft) during the course of a year. The draft EIS states, "Fluctuations in water-table elevations have been known to release trapped oil and allow it to move with ground-water flow." The potential for a serious health hazard or economic dislocation to the residents of the valley is very strong.

This summary of the ground-water conditions in the Helena area is correct, and it is true that a slow leak could add up to a major quantity of oil lost. DNRC does not agree that there would be a serious health hazard. As explained in the draft EIS (p. 76), contaminated water would have an objectionable taste well below chronic-toxicity level, and filters are highly successful in removing dissolved oil from water. There could be economic dislocations to affected landowners. These persons could approach NTPC for redress.

The Helena Valley has experienced rapid growth—and the accompanying construction use of heavy, earth-moving equipment—in the area that would be crossed by the pipeline. Construction would take place during the spring, summer, and fall when the ground water is highest and is most susceptible to impact from an oil spill. This would indicate that the probability of a rupture would be higher in areas such as the Helena and Missoula valleys.

There is no question that in developing areas where there is considerable digging and movement of large equipment, there is a higher risk of the pipe breaking than there is in otherwise similar areas. Although such leaks would usually be discovered immediately, some would be so fast-flowing that much oil would escape before the leak was stopped. In that case, ground water could be contaminated, given a shallow water table and permeable soil (see tables 27 and 32 in the draft EIS). However, this risk is not great enough to warrant selecting a route that avoids these areas.

A report on ground water done by Westech, Inc. (1979) states, "Small undetectable leaks are the most common mode of pipeline failures...such leaks could go undetected for a long period of time and could contaminate large volumes of ground water before a problem was suspected."

DNRC agrees with the quote from the Westech report and used this material in the draft EIS. DNRC (and Westech) concluded, however, that the risk of ground-water contamination is low compared to potential impacts on surface water. Surface streams can carry floating and dissolved oil great distances in short times, and do immense damage. The impacts to ground water, however, are generally localized because ground water moves slowly. Contaminated ground water is difficult to clean up, but the effects can be controlled by filters.

The risk to ground water in the Ninemile and Sixmile areas, particularly in sections that have been developed for rural residences, is much higher than indicated in DNRC's studies. There are numerous wells that were not noted, and many shallow aquifers in risk category 5 that should have been mapped.

The ground-water study did not attempt to obtain up-to-date information about every well along all the routes studied; existing information, such as that on topographic maps, was used to obtain general comparisons of the relative number of wells. In rapidly developing areas, such as Ninemile, DNRC's estimates are probably low. The overall mapping of ground-water risk category in the Ninemile and Sixmile areas is accurate, to DNRC's knowledge. Detailed surveys to map local areas of high risk should be done by NTPC as it develops its Oil Spill Contingency Response Plan.

VEGETATION

Dust and weed control may be a problem over the right-of-way during the years reclamation is underway. This should have been discussed more completely in the draft EIS.

These problems should certainly be dealt with by NTPC in its final reclamation plan. DNRC has recommended specific mitigating measures (see appendix A) that NTPC should include to prevent dust and weed problems.

The most highly productive forest habitat types are often riparian habitats that are important to other resources as well as timber.

DNRC agrees that riparian forests are of special value and should be avoided during centerline selection wherever possible.

Right-of-way maintenance plans should be included in the final EIS and should contain such controls as procedures, frequency, and access for vegetation control and other operations.

Formulation of a maintenance plan is beyond the scope of the EIS process. However, DNRC has recommended certain mitigating measures that should be incorporated with NTPC's maintenance plan.

Noxious weeds would surely be a problem on the right-of-way. Who would bear responsibility and expense for the required control?

The responsibility should be determined during easement negotiations between NTPC, the landowner, and the county.

WILDLIFE AND HABITATS

The Siegel Creek area is extremely important for many wildlife species, and severe impacts from pipeline construction would be unavoidable.

DNRC agrees and recommends that NTPC develop a compenstion plan for such unmitigated wildlife impacts (see chapter four).

DNRC did not adequately consider the USFS environmental assessment of the Northern Tier Pipeline and the USFS route alternatives in the Ninemile-Frenchtown area (USDA 1979b). DNRC's conclusion that no irreversible or irretrievable impacts to wildlife habitats in that area would directly result from the Northern Tier Pipeline is in direct conflict with USFS's conclusions.

Since wildlife and habitats are considered renewable resources in the study area, DNRC does not consider long-term population losses to be irreversible or irretrievable impacts to wildlife species, since no extinction of species or gene pools are expected to result from the facility. In addition, disturbed habitat can theoretically be reclaimed after pipeline abandonment. However, unmitigated net population losses do represent an irretrievable loss of viewing and hunting opportunities. DNRC agrees that wildlife losses in these areas could be great if not properly mitigated. However, implementation of the mitigating measures presented in this document should be effective in reducing impacts.

Big-game winter ranges in the Spring, Edith, and Roman creek drainages in the Ninemile-Frenchtown area should have been shown on the "Wildlife and Habitats" map in the draft EIS.

DNRC agrees and recommends that USFS big-game information in this area should be used during centerline study.

All mitigating measures listed under "Wildlife and Habitats" in the draft EIS are useful and should be retained in the final EIS; in addition, the following measures are recommended:

1) **Detailed centerline study including soils and vegetative analysis**
2) **Continuous monitoring of construction and reclamation activities by state officials having stop-work authority**
3) **Requirement of full compensation of wildlife losses where mitigation efforts are ineffective**
4) **Burial of power lines to pump stations, or the arrangement of the lines on poles or towers to ease visual impacts and prevent the electrocution of large birds**
5) **Provisions for additional wildlife enforcement personnel to protect wildlife during construction**

Suggested mitigating measures (1), (3), and (4) have been included in DNRC's recommended list of measures. Additional wildlife enforcement personnel may be provided if warranted by the findings of the centerline study. See chapter three for a discussion of state monitoring of construction.

A separate environmental assessment should be required for pipeline reexcavation after abandonment. Pipe should be left in place to avoid the impacts associated with salvage unless this proves more damaging to the environment than excavation. This assessment should address groundwater impacts more carefully than did the draft EIS.

If state permits are required to allow reexcavation, determination of additional EIS requirements would be made by the appropriate state agencies.

Considering wildlife impacts only, the best pipeline route through the state would be the DNRC Modification Route west of Bonner, NTPR east of Bonner to Jordan, and the DNRC Modification Route east of Jordan through Richey.

Except for the segment east of Jordan through Richey, this is the DNRC Recommended Route. In the Jordan area, DNRC determined that NTPR would be preferable due to differences in length and to strippable coal reserves located along the DNRC Modification Route.

Special consideration should be given during centerline study and construction to western bluebird nesting habitat along NTPR near Plains.

DNRC agrees.

Why does mitigating measure (5) on p. 37 of *Northern Tier Report No. 2* call for hand clearing of vegetation? Construction will be done by the use of machinery.

At the sensitive areas mentioned in this mitigating measure, machinery may not be allowed to operate during vulnerable time periods. Hand clearing, however, may be permissable and would allow clearing to proceed to avoid unnecessary construction delays.

Will on-the-ground inspections and approval of clearing boundaries be done in conjunction with an environmental inspector? How might this affect pipeline construction progress?

The review/approval would be accomplished by state representatives on state lands during centerline evaluation. Review/approval of private land could be done by the Interagency Task Force at the request of the landowner. Since boundaries would be approved prior to construction, progress would not be interrupted. However, in certain areas to be identified during centerline evaluation, a narrower cleared construction right-of-way might be required; this could slow construction progress.

Requiring right-of-way surveillance flights at altitudes above 305 m (1,000 ft) in certain environmentally sensitive areas would severely reduce the effectiveness of aerial inspections for existing or potential operational problems.

The trade-off between wildlife disturbance and effectiveness of inspections should be made during centerline evaluation on a case-by-case basis. Unmitigated impacts due to wildlife disturbance during such flights could be dealt with by compensation as necessary.

NTPC's "Oil Spill Contingency Response Plan" describes in detail techniques for preventing or mitigating oil contamination of birds, but does not establish criteria for determining the cost-effectiveness of rehabilitation in terms of its overall effect on bird populations.

DNRC has recommended that NTPC establish such criteria before final review approval of the Oil Spill Contingency Response Plan by the state.

Snags encountered along the right-of-way should be left standing unless clearly demonstrated to be a safety or fire hazard. This would allow their continued use by cavity-nesting birds and mammals, and would be consistent with BLM policy.

Although most important snags could be avoided during centerline evaluation, this is an appropriate mitigating measure and has been included in DNRC's final recommendations for mitigation.

On p. 85 of the draft EIS, an example was given to illustrate the significance of potential impact on wildlife. Mobile animals such as moose and osprey would not be physically destroyed during construction. There needs to be a clarification of physical and habitat losses.

The example given was hypothetical and illustrative. It was not meant to imply that moose or osprey would necessarily be destroyed by pipeline construction; rather, it was intended to illustrate that habitat destruction generally results in more significant wildlife impacts than physical losses. Habitat alteration and direct mortality were addressed separately in the draft EIS.

The list of wildlife species presented in table 35 of the draft EIS and the reasons for their listing are inadequate. Weren't nongame species and all state species of special interest or concern considered? Reference to *Northern Tier Report No. 2* was not sufficient explanation.

Since Montana harbors approximately 350 species of birds, 100 mammals, and 36 reptiles and amphibians, it would be very costly to list, describe, and map each species found over a study area as large as this project's area. Further, it would not add information useful to assessing the impacts of the proposal, since available data indicate that most of these species would not incur significant impacts as a result of the project. Therefore, from the complete list of species shown on p. 85 of the draft EIS, those species which were most likely to be significantly and adversely affected at the population level by pipeline-related impacts, and for which suitable corridor-level inventory data were relatively available, were selected for mapping and hence for inclusion in table 35. See pp. 422-427 of **Classifications, Inventory, and Analysis of Fish and Wildlife Habitat: the Proceedings of a National Symposium** (USDI 1978) for a complete discussion of the criteria used to determine inclusion in table 35. Note that over 40 percent of the species listed in table 35 are nongame. Species of special interest or concern are not necessarily those which could be adversely affected by the proposal.

What about the quality and quantity of the 59 ha (145 acres) of habitat, and the species using those habitats, that would be lost due to construction of pump stations and delivery facilities?

Only tentative locations of pump stations and delivery facilities have been identified; precise location depends on final design and, in some cases, can vary up to 24 km (15 mi) from the locations shown in the draft EIS. Instances where these tentative sites overlap with wildlife areas of concern have been shown in map 8 of the draft EIS. Actual sites would be identified during centerline evaluation.

Removal of vegetation is not likely to adversely affect wildlife as indicated in the draft EIS since, except for isolated instances of removal of critical habitat, the benefits of the narrow strip of "edge" would outweigh the losses.

DNRC agrees that habitat alteration along rights-of-way can have either detrimental or beneficial effects, and emphasizes that the actual net effect depends almost entirely on centerline location, timing and methods of construction, extent of mitigation, and the amount of effort directed at enhancement of right-of-way habitat for the benefit of target wildlife species. DNRC's recommended mitigating measures (see appendix A), if adhered to, would minimize potential adverse effects and maximize potential beneficial effects. As part of its compensation plan, NTPC could study existing rights-of-way in Montana and do a comparative study of different management techniques along the Northern Tier Pipeline right-of-way; these are badly needed to identify the optimum management strategies for different types of habitat.

The pipeline trench will be open for very short periods (less than ten days) and is unlikely to pose a problem to migrating animals; skip-trenching, where needed, is included in NTPC's proposal.

If migration routes were identified and avoided during centerline evaluation, and if the trench were not kept open during the peak of migration, interruption of migration routes would not be a problem. DNRC is concerned, however, that unexpected circumstances resulting in long stretches of trench being left open for ten days or longer be properly mitigated. This is especially important where coupled with long stretches of welded pipe adjacent to the trench.

Is the peregrine falcon referred to in table 35 of the draft EIS the Arctic or American peregrine falcon?

Both are included in the species.

Why were the grey wolf, whooping crane, swift fox, and blackfooted ferret not listed in table 35?

The swift fox and grey wolf were not identified as a species of concern in this study because no evidence exists that Montana populations would likely be affected by the proposal. No resident populations are known in any of the study corridors, and lone individuals or nonbreeding groups are wide-ranging and not particularly vulnerable to pipeline-related habitat loss. The whooping crane and black-footed ferret were identified as species of concern and are listed in table 35.

DNRC's statement that all active bird nests would be abandoned if construction occurs during the breeding season is strictly conjecture unless the statement implies "within the construction zone."

The statement referred to reads, "If construction occurs during the breeding season, it is likely that all active bird nests would be abandoned—and hence the current season's production lost—*within the right-of-way, as well as within a strip of land extending an undetermined distance on either side*." (Emphasis added.) DNRC stands by this statement, as it refers to the construction zone.

Many comments supported DNRC's compensation plan for unmitigated wildlife losses, but asked who will monitor, place values on, and develop the management plan for monitoring. Comments also noted that implementation will be difficult considering the amount of private land crossed.

DNRC has recommended that a compensation plan be developed by NTPC in cooperation with the Interagency Pipeline Task Force. Possible categories of compensation are given in chapter four.

Any pipeline routing in the Siegel Creek drainage would result in a severe reduction in winter big-game habitat and in the complete loss of riparian habitat.

While it is indeed possible that a pipeline route in this area could adversely affect winter range and reduce the amount of deciduous riparian forest, it is not correct to imply that any centerline in this area would have the extreme effects mentioned. DNRC considers centerline evaluation on state lands by state agencies and adherence to recommended mitigating measures by NTPC to be of utmost importance in minimizing potential adverse effects. For losses that cannot be mitigated in this area, compensation should be considered.

Mountain grouse, ring-necked pheasant, mule deer, white-tailed deer, and pronghorn antelope are unlikely to be affected by significant changes in habitat availability, especially since impact can be reduced or eliminated through proper construction timing, right-of-way reclamation, minor centerline adjustments, and other mitigation procedures.

While the potential certainly exists for adverse impacts to the species noted above, DNRC agrees that many of these impacts can be greatly reduced or eliminated by the measures suggested. Coordination of these measures by the Interagency Pipeline Task Force would be one of the key determinants of the actual net environmental impact of the proposal.

Shooting of birds should not be included as a probable impact of the pipeline. NTPC will strictly forbid carrying of firearms by construction personnel. Violation of this regulation would be cause for automatic dismissal.

DNRC agrees that firearms should not be allowed on the construction site; however, off-site or off-hours firearm control is a violation of personal rights. Therefore, shooting of wildlife by pipeline workers cannot be completely controlled.

The right-of-way would increase public accessibility, but NTPR does not intrude into any roadless security areas identified and protected by state or federal agencies.

NTPR crosses one roadless area important to elk near the head of Ninemile Creek; this area is especially important since it is one of the few large blocks of uncut, unroaded habitat remaining in the area. The DNRC Recommended Route avoids this area.

NTPC contends that no access roads will be maintained during operation except those to pump stations, where required.

DNRC is concerned with off-road vehicle access to the cleared permanent right-of-way. While not a true access road, the cleared right-of-way could be heavily used by the public, resulting in potential wildlife impacts.

CLIMATE AND AIR QUALITY

The section on climate impacts in the draft EIS is deficient; it does not mention that when occurrences such as a mudslide or flood damage the pipeline, the leak-detection system could also be damaged and power supply to the valves interrupted. Therefore, any resulting leak could be of far greater magnitude than if the detection system and valves were in operation. The final EIS should discuss the relationship between the types of climatic influences (such as extremely cold temperatures or rain followed by flooding) that could affect the pipeline's operation and the increased risk of disruption of the power supply. It is obvious that any force strong enough to damage the pipeline is sufficient to knock out the power supply.

There is no evidence that the operation of leak-detection systems or valves would be affected by climatic influences. The power supply system would be as vulnerable to hazardous conditions as any other power-supply system. Such systems are rarely "knocked out."

The power for Montana's portion of the pipeline might temporarily come from MPC's Bird plant, which could contribute to air pollution, and would later be supplied by Colstrip 3, which will definitely pollute the air. The final EIS should include an analysis of the potential effects on air quality from operation of the Bird plant. It should also state that the power needs of the pipeline would create additional pressure for construction of Colstrip 3 and 4.

The power supply for the Northern Tier Pipeline would come from the regional electrical grid. It is not possible to connect NTPC's, or any other individual power consumer's, requirements to a particular power production source. Therefore, it is not possible to determine specific impacts of additional power generation. Need is not one of the remaining legal issues associated with construction of Colstrip 3 and 4.

The draft EIS states that air pollution dispersion varies greatly across the state and is dependent upon existing weather patterns. Local control of NTPC's slash burning is needed to make allowances for such localized variables.

The open burning of slash would be under only state control (see p. 14 for a list of state permits). There is no local control of the burning; however, DHES could take local conditions into account.

CHAPTER SIX

CORRECTIONS AND ADDITIONS TO THE DRAFT EIS

CORRECTIONS

Page Correction

5 Line eight of the sixth paragraph in column one should read, "East of Bonner, no route is clearly better than the Northern Tier Proposed Route from an aquatics standpoint."

Line thirteen of the sixth paragraph in column one should read, "The Hi-Line Route has a major advantage over the Northern Tier Proposed Route in avoiding two Missouri River crossings and a Blackfoot River crossing, but affects many more streams in the Blackfoot drainage than either the DNRC Modification Route or the Northern Tier Proposed Route."

The second paragraph in column two should be changed to read, "Because it crosses fewer high-quality streams and closely parallels fewer kilometers of such streams than does any combination of the routes, the St. Ignatius Route would probably have the least impact on aquatic life and habitats."

8 In table 1, the permits for crossing designated floodplains and lake protection areas listed under "Department of Health and Environmental Sciences" should be deleted.

Also in table 1, under "Department of State Lands," the following remark should be added, "Approval is contingent upon satisfaction of conditions placed on the easement to protect the resources or other interests on the state-owned lands involved." (See p. 14 for a revised version of this table).

9 In the first line of the introduction, "Montana" should be changed to "Delaware" so that the phrase reads, "NTPC is a Delaware Corporation."

14 In line eleven of the second paragraph in column three, "condition" should be changed to "contour" so the sentence reads, "Additional backfill might be required to restore the right-of-way to its original contour."

40 The first paragraph of the section entitled "Trenched Pipeline Crossings" has been expanded to read as follows:

"Most pipeline river crossings in the U.S. have been installed by trenching. Using this method, a trench is excavated in the streambed, the pipe laid, and the trench filled. Trenched pipeline crossings may need a wider-than-normal right-of-way for temporary storage of excavated ditch spoil. The pipe would have to be strung, bent, welded, concrete-coated, and prehydrotested before any instream work could begin. Welds would also have to be radiographically inspected. To form the crossing ditch, the streambed would be excavated with backhoes, draglines, or dredges, depending on the width of the stream, the streamflow, and streambed material. The ditch would have to be deep enough so that the pipe would be at least 1.2 m

(4 ft) below the maximum predicted scour depth. Excavation for this trench, with a bottom width of about 2 m (7 ft), may require streambed disturbance many times wider than that experienced on dry land. For example, assuming a 7.6-m (25-ft) depth (to compensate for scour potentials) and an angle of repose of 3 horizontal to 1 vertical for the trench walls in the saturated streambed materials, the width of the trench at the top would be about 49 m (160 ft). The material excavated from the streambed should be removed and stockpiled on the banks to reduce sediment production and preserve the materials for backfill after the pipe is laid. After excavation, the pipe—which may be in sections over 100-m (328-ft) long—would be pulled into place with rollers, floats, pulling winches, and sideboom tractors. After the pipe is in place, the ditch must be backfilled, the river banks restored, and the area cleaned up and reclaimed."

41 In table 25, "Cannot be repaired without excavation into streambeds" should be added to the disadvantages listed for trenched river crossings.

43 The caption for the photograph in the third column should read, "Discharge hose eroding ditch spoil into stream."

45 In the legend for map 3, under "Historical Earthquakes," the second sentence within the parenthesis should be deleted and the following should be added: "The map does not show quakes of magnitude less than 3. Many quakes of magnitude 3 or 4.5 are also not shown because of incomplete data before 1960."

50 In table 27, risk potential for corrosion should be "Moderate" rather than "High."

51 Mitigating measure (13) in column two should read, "Having the state review the locations and spacing of check and block valves."

56 In line two of the second paragraph in column two, "generally" should be added so the first two lines read, "The effect of the construction and operation of the proposed pipeline would generally be."

68 The last sentence of the third paragraph in the third column should read, "A pipeline rupture during operation could be particularly damaging to aquatic resources."

69 In paragraph two of the first column, "and pipeline leaks" should be added to line six so that the phrase reads, "demonstrating the need for concern over very small construction-related spills and pipeline leaks."

The last sentence of the third paragraph in column one should read, "In most cases, indirect damage (resulting from destruction of food supply, eggs, or larval) to fish populations and displacement (from avoidance or changes in habitat) probably occur long before adult fish are directly harmed".

In line nine of paragraph one in column three, the phrase set off by parenthesis should read, "(deposits of gravels, rocks, or cobbles without any fine-grained sediments that allow water to flow below the ground surface before emerging as surface flow farther downstream)."

73 Line three of paragraph one in column one should read, "In many cases, small tributary streams (which are the most vulnerable to blockage) provide."

74 In mitigation measure (2) at the top of column two, "100 m^3" should be "100 m^3/d."

92 The second paragraph in the second column should read, "Adverse impacts to wildlife that are unavoidable even with the best reclamation or mitigation techniques may be compensated by:".

97 Total length for NTPR west of Bonner should be "179" rather than "177" and east of Bonner should be "837" rather than "827." The St. Ignatius Route should be "1,007" rather than "1,020."

Under "Air Quality," dispersion potential for NTPR and the DNRC Modification Route west of Bonner should be "poor" rather than "fair."

132 The last sentence in paragraph two should read, "The Big Dry Creek crossing closest to Fort Peck would be particularly important in this regard as a pump station would be located there." The following sentence should be added, "In addition, Big Dry Creek is important for spawning of game and forage fish out of Fort Peck Reservoir."

136 In the third line of the last paragraph. in column one, "NTPR" should be changed to "the St. Ignatius Route."

The first paragraph in the second column should end with the following statement, "Statewide, this route crosses fewer waterways than any combination of alternative routes."

ADDITIONS

Chapter Four

As stated on p. 22 of the draft EIS, time constraints did not allow the inclusion of a sensitivity analysis. The analysis has since been done, and a summary of the results is presented here as an addition to chapter four of the draft EIS.

Sensitivity Analysis

The results of the benefit/cost analysis summarized in tables 21 and 22, pp. 32 and 33, of the draft EIS are based on assumptions made with some degree of uncertainty. A sensitivity analysis provides insights into the relative importance of changes made in the assumptions.

The sensitivity of the results of DNRC's benefit/cost analysis to each of the selected assumptions is found by changing one assumption at a time, while leaving the remainder of the assumptions identical to those in the original analysis. Table 3 lists the assumptions, the original value of the assumptions, and the test values.

The results of the benefit/cost analysis essentially were not changed by altering the values of the assumptions. No change occurred in the ranking of the alternatives, and no alternative had negative net benefits. Therefore, with respect to the assumptions tested, the benefit/cost analysis does have some reliability as a decision-making tool.

TABLE 3. THE ORIGINAL AND TEST VALUES OF THE ASSUMPTIONS USED IN THE BENEFIT/COST ANALYSIS

ASSUMPTION	ORIGINAL VALUE	TEST VALUES	
		1	2
Incremental price of crude oil in base case	$7.00 + (world price)	$5.00 + (world price)	$9.00 + (world price)
Rate of change in the world price of crude	+ 2%/year	0%/year	+5%/year
Social discount rate	10%/year	8%/year	12%/year
Price elasticity of demand	-0.4	-0.3	-0.5
Level of demand[1]	Intermediate	Low	High

[1] Bonner and Moore 1978

Chapter Six

The following is an addition to "Electrical Services" in chapter six.

Alternative Power Sources for Pump Stations
Alternative power sources exist which NTPC could use to generate power for the pump stations. Such sources are diesel, natural gas, and light fractions separated from the crude (which require separators at the pump stations). All three methods are less cost-effective than electrically driven pumps and would result in higher noise and emissions levels. See p. 94 of the draft EIS for diesel-emission factors.

Appendix G

USFS identified the Driveway Ridge Route after the draft EIS was compiled (USDA 1979c). DNRC has since done a comparison of this route to the DNRC Recommended Route through the Prospect Creek area. The following discussion of the USFS Driveway Ridge Route is an addition to Appendix G, "Description and Potential Impacts of the Alternative Routes."

USFS Driveway Ridge Route
This route follows a high ridge on USFS land north of Prospect Creek, between Thompson Pass and Thompson Falls, and is approximately 33 km (21 mi) long. The DNRC Recommended Route along Prospect Creek is about 26 km (16 mi) long, crossing approximately 21 km (13 mi) of national forest land and 5 km (3 mi) of private and state land.

Engineering and Geotechnical Concerns. Construction along the narrow, rocky, winding ridge would not be easy or cheap, but it would be possible. A new pump station would probably be needed to move oil over the high ridge, which would result in increased pumping costs. There are nine separate sections on the Driveway Ridge Route, a total of about 13 km (8 mi), where the route would traverse steep sideslopes. Extensive sidecuts would be needed in these sections. To reach the ridge, the route climbs approximately 488 m (1,600 ft) above Thompson Pass; as it follows the ridge, the route changes in elevation by as much as 244 m (800 ft).

In contrast, the DNRC Recommended Route follows easily excavated alluvium along the bottom of the valley of Prospect Creek. The primary construction problem would be burying the pipe below the calculated scour depth of the creek. If NTPC buries the pipe as proposed, flood scour should not be a problem along Prospect Creek.

Land Use. The Driveway Ridge Route has no potential for subdivision or other construction, while the DNRC Recommended Route would hinder such development, particularly on private land.

Visual Quality. Northeast of Thompson Pass, the Driveway Ridge Route follows the rugged, scenic divide at the head of Twenty-four Mile Creek, where the ridge is scalloped by glacial erosion and has high visual value. It then runs along the sinuous, partly forested, narrow Driveway Ridge, following in part logging and fire-control roads. The route is generally out of view from roads along Prospect and Clear creeks, but would be visible from the Prospect Creek road for approximately 2.5 m (1.5 mi) where the route descends the steep, forested, eastern end of Driveway Ridge and connects with NTPR.

The DNRC Recommended Route closely follows several existing electric transmission line rights-of-way and a road, but would result in high impact.

Soils. The Driveway Ridge Route has a high potential for soil erosion during construction and reclamation of the pipeline because of the extensive areas of steep terrain and shallow soil and because of the short growing season along this route. Thus, it would have somewhat higher impacts to soils than would the DNRC Recommended Route along Prospect Creek. USDI (1979c) describes erosion hazard along Prospect Creek as "low" and along Driveway Ridge as "low to moderate" except in "occasional areas having a highly erodible ash mantle."

Aquatic Life and Habitats. The Driveway Ridge Route would have far fewer adverse impacts on aquatic life and habitats than would the DNRC Recommended Route along the valley bottom of Prospect Creek. Prospect Creek is crossed once by the Driveway Ridge Route, as compared to seven times by the DNRC Recommended Route. In addition, the Driveway Ridge Route avoids crossing numerous tributary streams in the drainage and does not closely parallel Prospect Creek. Thus, the many impacts associated with construction up a steep stream valley would be avoided.

Ground Water. The Driveway Ridge Route is, for the most part, far from any existing or prospective ground-water users. For approximately 2 km (1.2 mi) at the lower eastern end of the ridge, there is shallow, good-quality water that could be contaminated in the event of an oil spill. The DNRC Recommended Route follows the alluvial valley of Prospect Creek, with shallow, good-quality ground water along its entire length.

Vegetation. Regardless of centerline location, both the Driveway Ridge Route and the DNRC Recommended Route along Prospect Creek would require considerable forest clearing. The precise impacts would depend largely upon centerline location in relation to existing corridors—that is, relative to existing fireline and forest road clearing along Driveway Ridge, and relative to the cleared power line and road rights-of-way in Prospect Creek. The valley-bottom vegetation habitats along Prospect Creek are generally more productive than the high-elevation, ridge-top habitats; hence, the long-term loss of forest productivity would likely be more severe along the creek. Since the Driveway Ridge Route is 5.8 km (3.6 mi) longer than the DNRC Recommended Route, it is possible that the former would affect more forested land overall, in spite of the lower productivity. According to USDI (1979c), the Driveway Ridge Route could result in the long-term removal of more than twice as much land from timber production as the DNRC Recommended Route.

Wildlife and Habitats. Both the Driveway Ridge Route and DNRC Recommended Route along Prospect Creek cross considerable deer and elk winter range, but both could make use of existing cleared rights-of-way. The present level of human disturbance is higher along Prospect Creek than along Driveway Ridge. According to USFS (USDA 1979c), wildlife impact is greater along Driveway Ridge than along Prospect Creek.

Summary

Both Prospect Creek and Driveway Ridge are poor areas to route a pipeline through. One must be chosen, however, because there are no known better alternatives. The USFS Driveway Ridge Route could reduce the severity of certain environmental impacts, especially impacts on the water quality and fisheries of Prospect Creek, land use, and riparian habitats. However, USFS estimates that the costs of construction along Driveway Ridge would be at least $2.4 million more than those of routing through the Prospect Creek area. This amount does not include costs of additional pumping capability. If compensation costs were less than this, strict mitigation, surveillance, and compensation of unmitigated impact along Prospect Creek would be more cost-effective than routing along Driveway Ridge. Therefore, the DNRC Recommended Route goes through the Prospect Creek area. In the absence of compensation, DNRC would recommend routing along Driveway Ridge.

APPENDIX A

MITIGATING MEASURES

The following is a list of mitigating measures that DNRC recommends be attached by the permitting agencies, where appropriate and legally authorized, as permit conditions or easement stipulations. This is not a comprehensive list, but does include the measures that DNRC feels are most important. A list of mitigation that NTPC has agreed to is on file at DNRC.

SITE-SPECIFIC MITIGATION FOR SENSITIVE AREAS

The following mitigation applies to particular areas that should be identified during centerline evaluation.

1) The final design of the above-ground facilities located in seismic risk areas should include careful design for resistance to damage from earthquake. Schnabel and Seed (1973) curves should be used when the pipeline and pump stations are designed. The following should be included in the design of the above-ground facilities to reduce earthquake damage: structural modifications to buildings, energy-absorbing foundations, and fail-safe shutdown features in the control system.

2) The final design of the pipeline and associated facilities should allow for earthquakes of magnitude 7 in the Townsend, Nevada Valley, and Helena areas; the design should include accommodation of an intensity of IX on the Modified Mercalli Scale.

3) Detailed geological and geophysical studies of critical faults should be completed before final route selection, including the faults in the Townsend, Helena, and Nevada Valley areas, the Ninemile Fault, and possibly the Hope Fault. If the studies identify locations where active or potentially active faults have offset surface materials, special design measures (such as V-shaped trenches) should be considered.

4) Increased pipe wall thickness and special engineering techniques, such as toe buttressing and underdrainage, should be required in all potential landslide and slump areas.

5) To reduce the risk of oil spills in areas of shallow, high-quality aquifers, pipe wall thickness should be increased.

6) Streambed data should be checked before calculation and adoption of final depths of burial.

7) Crossing techniques for certain streams should be determined after consideration of detailed subsurface geologic information.

8) Culverts should be used as substitutes for bridges on streams where the gradient is 0.5 percent or less, where there is little or no bedload transport, and where there is low susceptibility to icing or plugging with debris.

9) In areas such as winter ranges of ungulates or raptor nesting sites, inspection flights over the right-of-way should be at altitudes above 300 m (1,000 ft).

10) In some areas, maintenance inspections should be timed to occur when access roads are firm, dry, or frozen.

11) Earthen bridges should be left over the trench at specified intervals in some areas to allow passage of wildlife.

12) A construction right-of-way width of less than 27 m (90 ft) should be used in some areas.

13) Special logging techniques, hand clearing, or hand excavation should be required in certain areas.

14) Selective clearing should be used to make curved, wavy, or irregular boundaries in some areas.

15) In some areas, construction should be timed to take place when it would cause the least damage. Such periods of time (called "construction windows") can vary in length from days to weeks or to most of the year.

16) Clusters of shrubs and low trees of different height and shape should be planted where appropriate along the edges of the permanent right-of-way, creating a diverse edge habitat.

17) In some areas, small tree nurseries should be established over the right-of-way.

18) Special techniques should be used to reclaim areas such as:
    (a) Areas with short growing seasons
    (b) Areas with high salt content in soils
    (c) Areas where soils have high shrink-swell potential
    (d) Steep slopes
    (e) Badlands
    (f) Scenic forested areas
    (g) Waterway crossings

QUALITY CONTROL

1) The best-available control technology should be applied to all pipeline operations that release pollutants.
2) Stringent quality-control measures should be used to ensure that the pipe is completely coated with a suitable material.
3) Ultrasonic testing of the steel plate used for the pipe should be done before the pipe is manufactured.

4) NTPC and its contractors should formally and informally brief all contractor supervisors and employees on environmental constraints prior to and during construction, and should post reminders at job sites.

5) The state should monitor NTPC's construction, with special attention given to the following:
    (a) The state should monitor job sites to ensure that NTPC's inspection and supervisory personnel are adequately conducting quality-control inspections
    (b) The state should monitor pipe-coating, pipe-lowering, backfilling, and reclamation to ensure that they are done properly
    (c) The state should regularly make spot checks of hydrostatic testing and welding along the pipe and at associated facilities to ensure that tests and repairs are performed in a systematic and conscientious manner
    (d) The state should have access to NTPC's test and quality-control records
    (e) NTPC's "Construction Management Procedures" should be expanded to provide for efficient coordination with state and federal monitoring

6) NTPC should use strict quality-control and inspection to ensure that pipe with the proper wall thickness is used at all locations.

7) Reasonable precautions should be taken to protect, in place, all public land survey monuments and private property corners or boundary markers. If any such land markers or monuments are destroyed, they should be reestablished and referenced in accordance with the procedures outlined in the "Manual of Instructions for the Survey of the Public Lands of the United States" (USDI 1973). For private property, the specifications of the landowners should be followed.

8) Firearms should not be permitted to be carried in any vehicle or by NTPC personnel involved in this project while on or in the vicinity of the project right-of-way. Violators of any state, federal, or international law protecting wildlife should be referred to the proper authorities. Additional funds should be provided for more law enforcement personnel where appropriate.

9) Care should be taken to ensure that all gates are closed after entry or exit and that landowners incur no losses due to damages caused by NTPC or its construction personnel. Gates should be inspected and repaired and missing padlocks replaced when requested by the landowner.

10) Public travel through and use of active construction areas should be discouraged.

11) Subject to landowner approval, all fences crossed by the right-of-way or access roads should be "H" braced before the fence is cut and should have gates wide enough for all construction equipment. NTPC should replace with new materials and to the original standard, all fencing and gates that are cut, removed, damaged, or destroyed during construction. This should be done as soon as possible.

12) When required, cattleguards should be aligned at right angles with the roadway and should be accompanied by an off-road gate that is wide enough for all construction equipment.

13) General repair and cleanup of the right-of-way and access roads should be done throughout the project.

14) The method and location of disposal of any materials, waste, effluents, trash, garbage, oil, grease, chemicals, etc., should be subject to the approval of the landowner.

15) All used petroleum products should be hauled away. There should be no release of crankcase oil or other toxic substances into streams or soils.

16) Sanitary wastes should not be discharged into any streambeds. NTPC should provide refuse containers and sanitary chemical toilets, convenient to all principal points of operation. These facilities should comply with applicable federal, state, and local health laws and regulations.

17) Water used in hydrostatic testing, embankment-material processing, aggregate processing, concrete curing, and other wastewater processes should not be discharged into surface waters without treatment specified by the state.

18) All noncombustible wastes should be hauled away or buried. Permission should be obtained from the landowner before burial of these wastes.

19) Complete disposal of all slash resulting from the project should be required, in accordance with the slash hazard disposal laws. Some slash may be used in constructing barriers to inhibit travel on closed roads along the right-of-way; in other locations, slash should be piled up for disposal according to state law and landowner instructions.

20) Combustible wastes such as packaging material should be hauled away and disposed of before leaving any work area.

21) Generally, combustible wastes should not be burned. In instances where disposal by burning seems preferable, it should require the prior approval of the landowner and be done with small fires only to dispose of construction waste. NTPC should allow burning of refuse such as trash, rags, tires, plastics, or other debris only as permitted by the state.

22) NTPC should properly store and handle combustible material which could create objectionable smoke, odors, or fumes.

23) A detailed fire plan for prevention, control, and extinguishing of fires on or near the right-of-way should be developed in conjunction with the appropriate authorities.

24) NTPC should provide the necessary equipment for fire protection and control. Spark arresters and additional mufflers on some engines may be required in areas of high fire danger.

25) Blasting caps and powder should be stored in approved areas and containers, and always separate from each other.

26) Emergency evacuation services for construction personnel should be provided in counties where acute-care services may be limited.

27) Hydrostatic testing should include the following quality control mitigation:
    (a) Stream flow should be withdrawn under the direction of the state.
    (b) If a bank must be cut down or a sump enlarged for a pump, excavation should be done only where the streambed or

streambanks have already been disturbed (as at a trenched crossing).

(c) A baffle should be attached to the end of each discharge line and a board staked flat on the ground beneath the end of the baffle so that the water flows over the board before it reaches the ground.

(d) Water should not be discharged onto steep slopes. If this must occur, however, a location should be chosen which would not funnel the water into a natural drainage below the baffle.

(e) The test water, which may have high levels of grease, oils, and suspended sediments, should not be emptied directly into any waterway. Water should be discharged into a holding pond, tested for chemical and biological impurities, held until sediments have settled, and then returned clean to water courses.

(f) Toxic chemicals in hydrotest water should be prohibited.

CONSTRUCTION

1) Construction activities involving motorized travel should be prohibited or restricted in areas where the soil is wet and vehicles would cause extensive ruts, channels, or wind erosion.

2) Construction of new roads should be kept to a minimum and existing roads used wherever possible. If new construction access roads must be built, they should also serve permanent maintenance access requirements, subject to the desires of the landowners, and should be designed to cover the shortest distance possible without compromising engineering and construction standards.

3) Unauthorized cross-country travel and development of unauthorized roads should be strictly prohibited. NTPC should compensate any damages resulting from unauthorized cross-country travel or road development by construction crews.

4) The limits and location of access for construction equipment and vehicles should be clearly marked at each new site before any equipment is moved to the site. Construction personnel should recognize and understand the restrictions of the markers.

5) All roads should leave a 60-m (200-ft) horizontal buffer strip along waterways.

6) Proper fuel-system adjustment, regular maintenance, specified fuels, and good operating practices should be employed to reduce air emissions from construction equipment.

7) Roads should be adequately maintained by NTPC to meet the requirements of the agencies managing the roads. Private roads should be maintained by NTPC to meet requirements of the landowners.

8) Motorized travel on, scarification of, or displacement of stabilized talus slopes should not be allowed.

9) Workers should be bused to construction sites from housing areas or work camps when feasible.

10) The hauling of double-length pipe should be permitted only where it would not cause hazardous conditions.

11) Construction activities and travel should be conducted to minimize dust pollution. Water, straw, wood chips, dust pallative, gravel, combinations of these, or similar control measures may be used. Oil or similar petroleum derivatives should be avoided.

12) Noise and congestion should be mitigated through techniques such as equipment muffling and scheduling to avoid rush hours. Highly developed areas should be avoided.

13) All ruts made by machinery should be promptly filled to prevent channeling of runoff as well as wind and water erosion during and after road use.

14) Proper bedding, padding, and covering should be placed around culverts to prevent them from being crushed by heavy equipment.

15) Roads across streams should be only as wide as one traffic lane (5-to-6 m or 15-to-20 ft) so that the stream is disturbed as little as possible.

16) Before clearing begins, the state should make an on-the-ground inspection to approve/review clearing boundaries.

17) Within the clearing boundaries, only vegetation that would pose a hazard during construction or maintenance should be removed. Measures should be taken to minimize root disturbance when shrub removal is necessary.

18) All slash within the right-of-way should be disposed of before the end of the first winter after clearing. Debris that might block wildlife movement should be removed immediately.

19) All trees, snags, and other wood material cut during right-of-way clearing should be felled away from water courses and onto the right-of-way. Any debris that could be carried or fall into streams should be removed with a cable and winch immediately. Heavy equipment should not enter streams to remove debris.

20) All trees, snags, and other wood material should be cut so that stumps are not higher than 15 cm (6 in) from the ground on the uphill side.

21) In some areas, including all trenched crossings of streams having a high fisheries value, measures should be taken to speed construction. This could be done by working twenty-four hours a day, with double or triple shifts; welding pipe off of the construction sections; shortening construction sections; and hiring additional construction personnel.

22) Extra working widths required at river crossings for temporary storage of excavated ditch spoil should be cleared in a manner leaving at least a 15-m (50-ft) buffer strip of natural vegetation between the storage sites and the river to minimize destruction of riparian vegetation and to prevent siltation.

23) Material sites should not be located in or near streams. If material sites are approved adjacent to or in lakes, rivers, streams, or wetlands, then levees, berms, or other suitable means should be constructed to protect fish and fish passage.

24) To prevent degradation of the quality of nearby waterways, sediment retention basins should be built where appropriate to catch runoff from the right-of-way or access roads.

25) During trenching of most of the line, topsoil should be stored separately from subsoil (double-ditching); this would aid in rapid reclamation.

26) There should be no temporary instream storage of ditch spoil when water is running across the site.

27) All excavated material should be stored so that it will not wash into streams in the event of storms.

28) Embankments and backfill should contain no muck, frozen material, sod, or other potentially unstable materials. Loss of fill material should be prevented by constructing toe ditches; by erecting rock, boulder, earth, or log barriers at the toes of embankments; or by other suitable methods.

29) If it is necessary to dewater excavated footing sites for suspension towers, pits, or the pipeline trench when crossing a stream, silty water should be pumped to a settling pond.

30) Each pump intake should be placed within its own 1-m-square (3-ft-square) screen box to prevent fish from being sucked into the pumps and to prevent pump suction from holding fish against the screened side.

31) When crossing streams, ditch blocks, silt curtains, and other deterrents should be used to reduce the amount of sediment entering streams and the distance the sediment is transported.

32) The flow of smaller streams should be flumed or pumped around the crossing site during construction. Where river flow is naturally divided into two stable channels, the entire flow should be diverted through one channel while the crossing is constructed across the other.

33) If a ditch spoil in a waterway is excavated with a suction dredge, it should be pumped through a temporary floating pipeline to an impervious dike placed where the wet soil would not reenter the stream.

34) The trench at a waterway crossing should, if possible, be backfilled with material of the same grain size and shape as the excavated material. If this is not possible, the crossing should be backfilled with granular material containing little silt to minimize siltation problems downstream.

35) Temporary access over streambanks should be made through the use of fill ramps rather than cutting through the banks.

36) Heavy equipment use in waterways should be avoided through the use of draglines and barges. Where it is necessary to use equipment in streams (such as in very wide and shallow streams), dusty and greasy equipment should be steam cleaned.

37) Peak pressures of instream and streambank blasting should be minimized by using the smallest possible amount of explosive.

38) Temporary bridges or culverts should be used on flowing waterways during construction. These could be replaced with fords built to state specifications after construction if only occasional traffic is anticipated during operation and maintenance. Bridges or culverts should be removed with care not to damage streambanks and beds. Fords should be used during construction only on intermittant or ephemeral drainages.

39) The fill material used in construction of fords should be selectively chosen, sorted, and mixed so it is in the proper proportions to support traffic, prevent rutting, reduce siltation, and prevent washouts. Fords should be constructed to match the existing stream geometry as closely as possible.

40) In some areas, settling basins should be constructed at the outlets of culverts; baffles should be used at the outlets of culverts on high-gradient ephemeral drainages. Culvert inlets should be protected with cement, riprap, or other appropriate material to prevent erosion.

41) The bottoms of culverts should be placed 0.2 m (0.5 ft) below the natural streambed at the thalweg to prevent under-cutting.

42) Drainage structures should be placed on grade.

43) All crossings should be constructed as close to right angles to the streambed as possible.

44) Unless crossings can be drilled without interruption of water flow, irrigation canal crossings should be constructed only after harvest, especially where crossing irrigation systems that serve extensive downstream areas.

45) Support structures for aerial crossings should be located away from or adequately protected from the effects of scour, channel migration, undercutting, ice forces, and other external loads.

46) All drainage structures should be designed to pass the five-year flood at slow enough water velocities to allow passage of fish. Permanent drainage structures should be designed to pass the fifty-year flood. These structures should not be so large as to create flows too shallow for fish passage. Size should be determined following processes which take into account the variations in vegetation and climate zones in Montana, the amount of fill, and the drainage area above the crossing.

47) Where access roads are near streams, road embankments should be constructed at less than the normal angle of repose for the soil type involved.

48) When operations in a work area are complete, all temporary structures or fills installed to aid stream crossing should be removed and the flow of the stream reestablished.

49) Construction of all power lines associated with the pipeline should follow criteria presented in two handbooks: **National Forest Landscape Management, Volume 2, Utilities** (USDA Handbook 478) and **Environmental Criteria for Electric Transmission Systems** (USDA and USDI 1970).

50) All communication towers and above-ground power lines should be located and designed to minimize the hazard of bird collisions or electrocution.

51) Where possible, construction crews should be housed in existing facilities, such as mobile home courts, campgrounds, student rental housing, or private homes. Construction camps should be established only where suitable accommodations are not available. An infirmary should be provided at construction camps to minimize impacts on limited local health services.

52) Feeding of wild animals at construction areas, work camps, and other pipeline facilities should be prohibited. All garbage should be quickly disposed of in a manner that would not attract wildlife.

53) Any type of harrassment of wildlife along the route and at pipeline facilities should be prohibited.

54) Sensitive leak-detection systems should use the best available technology, including use of a combination of the flow-rate deviation, flow-rate balance, pressure deviation, and line volume balanced systems.

55) At aerial crossings of waterways, NTPC should investigate and incorporate protective measures to reduce the hazards of malicious and accidental damage to the pipe. The investigation should include the possibility of encasing the pipe within a second pipe.

56) Trench backfill that would force leaking oil to flow upwards should be used.

57) The state should review/approve the locations and spacing of all check and block valves.

RECLAMATION

1) To ensure that cleanup and reclamation are done as soon as possible and are in compliance with permit stipulations, a performance bond should be required from NTPC where locally authorized. If a performace bond is not required, an agreement should be made between the state and NTPC stipulating that NTPC would pay for any additional work necessary to meet the requirements of reclamation.

2) Reclamation should begin as soon as possible after construction but not when soil moisture is high or when the ground is frozen. All cut-and-fill slopes that would not be disturbed during trenching and pipe laying should be seeded and mulched as they are completed.

3) Whenever possible, revegetation should be done in a manner that maximizes benefits to wildlife species.

4) When it is necessary to remove the natural vegetation for the duration of the project, introduced species of grasses and shrubs should be those which are suited to the site's environment.

5) Soil characteristics should be considered when selecting suitable seed mixtures and when determining the amount and kind of fertilizer, compost, or other soil amendments needed.

6) Planting dates should be identified well in advance of construction and should be determined by analysis of a site's seed requirements and seasonal precipitation patterns.

7) When construction ends at a time of year when seeds for native species cannot be planted, seeds for nonnative annual species should be planted for temporary revegetation.

8) A minimum of 22.2 kg/ha (20 lb/acre) of pure live seed should be used throughout the state.

9) Nonleguminous forbs should be included in the seeding proposals.

10) The diversity of seed mixtures should be sufficiently high to avoid overdependence on a single species or type of grass (such as crested wheatgrass).

11) Soil erosion should be temporarily controlled until vegetation is reestablished with sediment traps, berms, slope drains, toe-slope ditches, diversion channels, sodding, and mulching.

12) Reclamation areas should be seeded by the appropriate technique determined by slope, soil characteristics, type of seed, and intended land use.

13) Areas where there has been recent reclamation or where there is new growth should be avoided. When it is necessary to enter reclamation areas, travel by foot or by vehicles with wide tires to minimize damage should be required.

14) Seed and fertilizer or compost should be on hand to ensure reseeding during the first possible planting dates after construction of each pipeline segment. Proof of purity, germination success, and content of inert materials in seed mixtures should be required before use.

15) Followup measures should be employed to ensure successful reclamation.

16) Revegetation should be considered successful if:

   (a) In rangeland, canopy cover of perennial species is 30 percent or more of that of adjacent range the year following revegetation (except in certain areas identified during centerline evaluation), and 90 percent or more of adjacent range within ten years (in most areas) or fifteen years (in the lowest precipitation zones or as determined by the state).

(b) In forested lands (except those within the permanent right-of-way or land cleared for permanent roads), the level of tree stocking on cleared land would be by maturity approximately the level of stocking in adjacent areas.

17) Stream channels and banks should be restored to their original configurations and thoroughly compacted. Banks should be stabilized with natural streambank materials similar to those on adjacent undisturbed banks, and with trees, grass, and shrubs where this vegetation occurs naturally in nearby areas. Riprap or gabions should be used only as a supplement or where such methods would improve existing fish habitat. Riprap should be covered with soil and reseeded if possible. In some cases tree stumps (including roots) should be used to stabilize the streambed and provide fish cover. The state should be consulted.

18) Closure of roads in areas where no cut or fill is made should be done by installing signs, constructing rock barriers or soil berms, planting trees, or other approved means subject to landowner approval. This should be done after completion of scarifying, water-barring, and revegetation.

19) All litter should be removed from the right-of-way and along access roads leading to the right-of-way within thirty days of completion of backfill. If requested by the landowner, NTPC should provide for removal of any additional debris after this initial cleanup.

20) NTPC should be responsible for correcting cultivated land compacted by equipment.

SPILL PREVENTION, CLEANUP, AND RECLAMATION

1) During construction, contractors should use techniques to minimize the possibility of spilled oil reaching a water body, including proper methods of refueling and repairing equipment, correct methods of storing and disposing of all petroleum products (for example, use of metal tanks rather than fuel bladders), and putting leak-detection systems in fuel lines at work camps. Catchment basins should be installed at storage areas to contain accidental spills of fuel, chemicals, oil, or other pollutants.

2) All personnel should be thoroughly briefed on reporting procedures and on what would be expected of them in the event of a spill.

3) Sufficient equipment to clean up at least a 20-m (5,000-gal) spill should be readily available and in good working order.

4) NTPC's "Oil Spill Contingency Response Plan" should include:
   (a) Site-specific procedures and a list of equipment that could be used in the event of ground-water contamination. Geologic and hydrologic information about critical and sensitive aquifers should be gathered before startup, rather than attempting to get this information after a spill has occurred.
   (b) Provision for ensuring rapid response to control the spread of spills wherever sensitive or critical ground water is at risk.
   (c) A list of state agencies and organizations to be notified.
   (d) A cleanup plan requiring the use of pollution-control equipment and trained pollution-control specialists.

5) Emergency access roads should be identified in advance, and their number kept to a minimum. Where possible, these should avoid sensitive areas such as wetlands, steep slope (over 10 percent), water courses, forests, compactable or erodible soils, and areas subject to wind erosion. There should be a buffer zone of at least 30 m (100 ft) next to a waterway to reduce adverse impacts. Private landowners and local, state, and federal officials should be provided with the locations of the road.

6) Areas should be reclaimed after cleanup, and followup checks should be done for several years. Special attention should be given to:
   (a) Replacing topsoil if removed or if damaged by fire. Special attention should be given to measures for soil replacement and restoration of shrub and grass steppelands in eastern Montana.
   (b) Making rapid establishment of vegetative cover a major reclamation goal.
   (c) Reclaiming roads and work sites near the spill.
   (d) Recontouring or filling in excavated areas as appropriate to the area.
   (e) Using special erosion-control techniques, such as mulching, if standard reclamation procedures fail.

(f) Reestablishing original streambanks, channels, and bottom gradient and sediments, where affected by the cleanup operation.

(g) Breaking up land compacted by equipment.

7) Temporary bridges and fill ramps should be used to cross waterways rather than cutting into streambanks.

8) Helicopters should be used for transporting personnel and equipment where spill cleanup does not require large machinery and where access involves crossing or working in wetlands or other sensitive areas where soils or stream environment might be severely damaged.

9) Excavation for fill or riprap should be coordinated with the local conservation district and the appropriate state and federal officials.

10) When temporary roads are necessary, where possible, locations should be flagged rather than bladed or graded.

11) Where sediment from cleanup operations or access endangers waterways, sediment-retention basins should be constructed.

12) Streambed material should be used for building spill-control structures only when use would prevent additional severe environmental damage. Biologists should be consulted to judge the relative severity of potential impacts.

13) All litter, debris, and other signs of the oil-spill containment operation should be removed after the spill has been contained and the contaminated soils are removed. Cleanup should be subject to the approval of the landowner. Combustible wastes should be removed rather than burned, unless done with small fires and the previous approval of the landowner and appropriate government agencies.

14) When oil spills occur in cool months, special care should be taken because oil-oxidizing microbes are partially temperature-dependent and less active during cool periods. When spills occur in cool weather, black plastic should be placed over the spill to increase soil temperature sufficiently for optimum microbial activity. Fertilizer should be applied to establish a 10:1 or 15:1 C:N ratio to ensure an adequate nutrient supply (Gudin and Syratt 1975).

15) Oil-soaked birds and mammals should be immediately rehabilitated following a major oil spill if cost-effective in terms of its overall effect on populations. If rehabilitation would not be cost-effective, losses should be compensated by enhancing habitat or employing some other form of compensation. Criteria for quickly estimating damage and the most cost-effective techniques should be reviewed/approved by the state.

16) The soil type of the spill area should be determined by sampling both contaminated and uncontaminated soil at a depth of 30 cm (12 in) and analyzing nutrients and oil content. Soils should be tested to determine the amount and kind of fertilizer needed, which could be applied with a broadcast spreader and mixed into the contaminated soil. Soils should be periodically tested. The length of time between tests should be dependent on precipitation and temperature (both of which influence microbial activity).

17) The site should be revegetated if an analysis shows that the oil content of the soils has stabilized and the demand for nutrients has decreased.

18) Grasslands should be revegetated by seeding the spill area with rapidly growing annuals and then seeding with species similar to other species in the area.

19) Native plants that have successfully grown on forested sites where oil has spilled should be used for revegetation.

20) There should be quick response to any malfunction of equipment or operational problem to aid in reducing potential air emissions. Valves and seals should be examined to ensure that there are no leaks, and equipment periodically tested to determine proper operation.

21) A filter should be placed in contaminated domestic or public water supply systems to temporarily remove dissolved petroleum compounds until contamination is eliminated or abated.

22) Water flooding, interception barriers, and pumping wells should be used to reduce ground-water contamination.

23) Impervious oil spill containment dikes or equivalent structures should be constructed around storage tanks at pumping stations and at other pipeline facilities that have a volume of at least 110 percent of the total storage volume of the storage tanks in the area. Dikes should be constructed to withstand failure from earthquakes. When built on flood plains, dikes should be riprapped on the outside for protection from flood waters.

PIPELINE OPERATION, MAINTENANCE, AND MONITORING

1) Only the minimum amount of vegetation necessary to accommodate operation, maintenance, and surveillance should be kept cleared.

2) An integrated weed control plan for right-of-way maintenance should be adopted; as much as possible, weed control by broadcast application of herbicides should be avoided at pump stations and delivery facilities, as well as on the right-of-way. Mechanical methods should be used where possible to control excessive vegetation growth on the right-of-way.

3) Proper fuel-system adjustment, regular maintenance, specified fuels, and good operating practices should be used to reduce emissions from diesel backup generators at pump stations.

4) Pipeline access roads should be closed to public use by installing strong gates. Vehicle use of the right-of-way should be prohibited.

5) Twice-weekly ground patrols of pump stations and delivery stations should be required.

6) A "one-call" system should be established for reporting any activity or emergency in the vicinity of the line so all appropriate agencies are notified.

ABANDONMENT AND REMOVAL

Measures that would mitigate impacts from abandonment of a pipeline are generally the same as those from construction and reclamation. The width of the right-of-way needed for removal of the pipe may be smaller than that needed for construction.

APPENDIX B

INDIVIDUALS TESTIFYING AT THE PUBLIC HEARINGS

HELENA HEARING

November 26, 1979

Stu Burwell
Helena, MT

Janelle Fallan
Helena, MT

Charles F. Hedges
Denver, CO

Pete Jackson
Helena, MT

Elroy Letcher
Helena, MT

Philip G. Morrow
Laurel, MT

Terry Murphy
Great Falls, MT

Laurie Olsen
Belgrade, MT

Gary R. Olsen
Belgrade, MT

Ralph Sandmeyer
Tulsa, OK

Donald W. Scott
Missoula, MT

Regan Whitworth
Billings, MT

HARLOWTON HEARING

November 27, 1979

Oscar Biegel
Harlowton, MT

Larry Budge
Harlowton, MT

M. A. Callant
Harlowton, MT

Peggy Delaney
Butte, MT

Jeff Doggett
White Sulphur Springs, MT

Gordon Doig
White Sulphur Springs, MT

Tom Glennie
Judith Gap, MT

Ande Grande
White Sulphur Springs, MT

Mike Grove
White Sulphur Springs, MT

Gordon Hickman
Harlowton, MT

Bill Jones
Harlowton, MT

Walter Krause
Golden Valley, MT

Gene Leary
Harlowton, MT

Edgar Lewis
Lavina, MT

Edgar Longston
Harlowton, MT

John C. Maher
Billings, MT

Gerald Miller
Harlowton, MT

Roy Patte
Ryegate, MT

Dick Pemberton
Harlowton, MT

Dave Piper
Harlowton, MT

Elmer Shy
White Sulphur Springs, MT

James W. Stobie
Billings, MT

Mel Vossler
Harlowton, MT

CIRCLE HEARING

November 28, 1979

Keith Casterline
Vida, MT

David Coston

Elmo Dreyer
Circle, MT

Dennis Ensworth
Glendive, MT

Herb Larson
Brockway, MT

Lyle Quick
Circle, MT

Eugene Schuld
Circle, MT

Harold Tolksdorf
Brockton, MT

Glenn Waller
Circle, MT

Kenneth Youngquist
Circle, MT

JORDAN HEARING

November 29, 1979

John W. Billing
Jordan, MT

Bill Brown Jr.
Sand Springs, MT

Glen C. Childers
Brusett, MT

Jerry Coldwell
Jordan, MT

George Hageman
Jordan, MT

Art Larson
Cohagen, MT

Nick Murnion
Jordan, MT

Edward Ritter
Jordan, MT

Raymond Shaw
Mosby, MT

HELMVILLE HEARING

December 3, 1979

Larry Dodge
Helmville, MT

Bev Erb
Helmville, MT

Mary Hamilton
Helmville, MT

Steve Hamilton
Helmville, MT

Henry McMurrough
Helmville, MT

Donald Sullivan
Helmville, MT

John Wilson
Helena, MT

THOMPSON FALLS HEARING

December 5, 1979

James Frye
Thompson Falls, MT

Melvin Hoy
Thompson Falls, MT

Leo Keane
Thompson Falls, MT

John McDowell
Thompson Falls, MT

Fred Moore
Thompson Falls, MT

Jan Rappe
Huson, MT

MISSOULA HEARING

December 6, 1979

John Appelt
Huson, MT

Susan Appelt
Huson, MT

Alice Austin
Missoula, MT

Dave Benefield
Missoula, MT

Jim Bolin
Missoula, MT

Richard Danielson
Missoula, MT

Ron Erickson
Missoula, MT

James R. Frye
Thompson Falls, MT

Peter Funk
Missoula, MT

Ed Grumbine
Missoula, MT

Karen Hatcher
Huson, MT

Hanneke Ippisch
Huson, MT

Charles Kay
Fairbanks, AK

Daniel Kemmis
Missoula, MT

Don Latham
Huson, MT

Surry Latham
Huson, MT

John R. McDowell
Thompson Falls, MT

Jim McNeery
Missoula, MT

Judy Majewski
Missoula, MT

Gary Matson
Milltown, MT

Paul Polzin
Missoula, MT

Tom Powers
Missoula, MT

Cindy Rappe
Frenchtown, MT

Jan Rappe
Huson, MT

Olleke Richardson
Frenchtown, MT

Mark Roache
Missoula, MT

Chris Siegler
Huson, MT

Don Snow
Helena, MT

Harriet Sperlock
Missoula, MT

Ralph Thisted
Huson, MT

BILLINGS HEARING

December 10, 1979

Don Allen
Helena, MT

Jack Besso
Billings, MT

H. S. Curtis
Houston, TX

Austin Darkenwald
Billings, MT

Jerry Driscoll
Billings, MT

Thomas F. Keating
Billings, MT

Tom Kryzer
Billings, MT

Phillip Morrow
Laurel, MT

Jim Sedgwick
Billings, MT

O. E. Stevens
Billings, MT

Suzanne Trusler
Lame Deer, MT

Regan Whitworth
Billings, MT

GREAT FALLS HEARING

December 12, 1979

Robert Barber
Denton, MT

Ike Kaufman
Great Falls, MT

Frank Moravec
Havre, MT

David Ward
Great Falls, MT

Kirk Wilson
Great Falls, MT

HELENA HEARING

January 10, 1980

Don Allen
Helena, MT

Don Burnham
Helena, MT

Stu Burwell
Helena, MT

Glen C. Childers
Brusett, MT

Richard Christian
Helena, MT

Aubyn A. Curtiss
Fortine, MT

Richard Danielson
Missoula, MT

Bob Decker
Helena, MT

Max Deibert
Billings, MT

Peggy Delaney
Helena, MT

Tom DeMoss
Houston, TX

Gene Donaldson
Helena, MT

Eugene Fenderson
Helena, MT

Ruth Gardner
Helena, MT

Jim Hodge
Seattle, WA

Peter Jackson
Helena, MT

Donald Johannsen
Shelby, MT

Judy Johnson
Helena, MT

David F. Johnston
Helena, MT

Don Jones
Helena, MT

Al Kington
Helena, MT

Ken Knudson
Helena, MT

Ed McHugh
Helena, MT

Adam McLane
Helena, MT

Robert L. Marks
Clancy, MT

Joan Miles
Helena, MT

James Mockler
Helena, MT

Joe Murphy
Helena, MT

James W. Murry
Helena, MT

James Nybo
Helena, MT

Larry Peterman
Helena, MT

Jim Robbins
Helena, MT

Noel Rosetta
Helena, MT

Jim Schwind
Helena, MT

Alan Shumate
Helena, MT

Gerald W. Smedes
Seattle, WA

Suki Smith (for Bob Rasmussen)
Helena, MT

Bobbi Spilker
Helena, MT

Peter W. Sullivan
Helena, MT

Charles van Hook
Helena, MT

Robert Voytoski
Helena, MT

Melvin J. Williams
Laurel, MT

John Wilson
Helena, MT

APPENDIX C

INDIVIDUALS AND ORGANIZATIONS THAT SUBMITTED WRITTEN COMMENTS

David B. Adkinson
Missoula, MT

John Appelt
Huson, MT

Suan Appelt
Huson, MT

Alice H. and Briggs M. Austin
Missoula, MT

Jack Besso
Billings, MT

Black Hills Alliance
Rapid City, SD

David Blair Jr.
Chevy Chase, MD

Building & Construction Trades Council,
North Central Montana
Great Falls, MT

Burlington Northern
Billings Region
Billings, MT

Burlington Northern
Rocky Mountain Region
Missoula, MT

Cascade County Commissioners
Great Falls, MT

Glen C. Childers
Garfield County

Clallam County/City of Port Angeles
Joint Task Force
Port Angeles, WA

Coalition for Canyon Preservation
Hungry Horse, MT

Consulting Engineers Council of Montana
Helena, MT

Don Cornish
Helena, MT

Lawrence B. Dodge
Helmville, MT

Senator Harold L. Dover
Lewistown, MT

Environmental Graduate Studies Program
University of Montana
Missoula, MT

Environmental Information Center
Helena, MT

Farmer's Union Central Exchange, Inc.
Laurel, MT

Fergus County Planning Board
Lewistown, MT

Fergus County Farm Bureau
Lewistown, MT

Friends of the Earth
Helena, MT

James R. Frye
Thompson Falls, MT

Ann Garde
Missoula, MT

Russ Garrin
Missoula, MT

Brian Giddings
Missoula, MT

Helena Area Chamber of Commerce
Helena, MT

Gordan Hickman
Harlowton, MT

Joseph Horvath
Missoula, MT

International Brotherhood of Electrical Workers
Helena, MT

Leo Keane
Thompson Falls, MT

Kris Kramer
Huson, MT

Laborers International Union
Missoula, MT

Laborers Local 1334
Missoula, MT

Dr. Don Latham
Missoula, MT

Surry Latham
Missoula, MT

League of Women Voters
Missoula, MT

Jarl Leirfallom
Missoula, MT

Lewis & Clark City-County Health Department
Helena, MT

Lewistown Area Chamber of Commerce
Agricultural Committee
Lewistown, MT

Lewistown Area Chamber of Commerce
Lewistown, MT

McCone Conservation District
Circle, MT

John R. McDowell
Thompson Falls, MT

Mavis McKelvey
Missoula, MT

Gary Matson
Milltown, MT

Montana Association of Counties
Helena, MT

Montana Department of Community Affairs
Helena, MT

Montana Department of Fish, Wildlife & Parks
Helena, MT

Montana Department of Health and
Environmental Sciences
Helena, MT

Montana Department of Highways
Helena, MT

Montana Department of State Lands
Helena, MT

Montana Farmers Union
Helena, MT

Montana Council of Cooperatives
Helena, MT

Montana Chamber of Commerce
Helena, MT

Montana Environmental Quality Control
Helena, MT

Montana Historical Society
Helena, MT

S. D. Piper
Harlowton, MT

Paul E. Polzin
Missoula, MT

Cindy Rappe
Huson, MT

Olleke Richardson
Missoula, MT

Rosemary Rowe
Helena, MT

Sierra Club
Northern Rockies Chapter
Helena, MT

Sierra Club
Upper Missouri Group
Helena, MT

Jeannie Siegler
Huson, MT

John R. Swanson
Berkeley, CA

Ralph Thisted
Missoula, MT

Times Clarion
Harlowton, MT

Scott D. Thompson
Helena, MT

Touchette Hill Homeowners' Association
Frenchtown, MT

U.S. Department of Agriculture
Forest Service
Missoula, MT

U.S. Department of the Interior
Bureau of Indian Affairs
Billings Area Office
Billings, MT

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Huson, MT

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Harlowton, MT

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Billings, MT

Joe Newman
Helena, MT

No Oilport, Inc.
Port Angeles, WA

Northern Tier Information Committee
Missoula, MT

Northern Tier Pipeline Company
Billings, MT

OS Property Owners Association
Simsbury, CT

LIST OF REFERENCES

Bonner and Moore Associates, Inc. 1978.
Draft energy demand forecasts for the Northern Tier and inland states. Prepared for USDOE.

Bowen, C. M. 1979.
Grayrocks - a new approach to mitigation. **The mitigation symposium: a national workshop on mitigating losses of fish and wildlife habitat**. pp. 434-438. G. A. Swanson, tech. coord. USDA Forest Service General Technical Report RM-65. Fort Collins, Colorado.

Burger, C., and Swenson, L. 1977.
Environmental surveillance of gravel removal on the Trans Alaskan Pipeline System with recommendations for future gravel mining. Special report no. 13 prepared for the Joint Fish and Wildlife Advisory Team. Anchorage, Alaska.

Burgess, R., and Huber, E. 1979 (October).
Biological monitoring on rights-of-way. Presented at the Second Symposium on Environmental Concerns in Right-of-Way Management. Ann Arbor, Michigan.

Gudin, C., and Syratt, W. 1975.
Biological aspects on land rehabilitation following hydrocarbon contamination. **Envir. Pollut.** 8:107-112.

Mountain West. 1979 (January).
Pipeline construction worker and community impact surveys. Prepared for NTPC. Billings, Montana.

Northern Tier Pipeline Company. 1978 (May).
Description of the proposed action. Submitted to DNRC. Billings, Montana.

__________________. 1979 (April).
Draft oil spill contingency response plan. Prepared for NTPC by Woodward Clyde Consultants.

Oliver, W. H. 1974.
Wildlife problems associated with reservoirs used for electrical power generation (with special emphasis on Wells Hydroelectric Project Wildlife Study). Washington Department of Game, Bulletin No. 3.

Pace Company. 1978.
Crude oil supply/demand outlook for the Northern Tier and Midwestern states. Houston, Texas.

__________________. 1979 (November).
Unpublished written comments on DNRC's **draft EIS on the proposed Northern Tier Pipeline System**. Houston, Texas.

Schnabel, P. B., and Seed, H. B. 1973.
Accelerations in rock for earthquakes in the western United States. **Bull. Seis**. Soc. Am. 63:501-516.

Thompson, L. S. 1979.
Mitigation as management: strategy and some alternatives. **The mitigation symposium: a national workshop on mitigating losses of fish and wildlife habitats**. pp. 222-228. G. A. Swanson, tech. coord. USDA Forest Service General Technical Report RM-65. Fort Collins, Colorado.

U.S. Department of Agriculture. 1979a.
U.S. Forest Service. Region 1. **Environmental assessment on the Northern Tier Pipeline proposal and alternatives in the Siegel Mountain area**. Missoula, Montana.

__________________. 1979b.
U.S. Forest Service. Region 1. **Environmental assessment on the Northern Tier Pipeline proposal and alternatives in the Ninemile-Frenchtown area**. Missoula, Montana.

__________________. 1979c.
U.S. Forest Service. Region 1. **Environmental assessment on the Northern Tier Pipeline proposal and alternatives along Driveway Ridge**. Missoula, Montana.

__________________. No date.
U.S. Forest Service. **National forest landscape management, vol. 2, utilities**. Handbook 478.

U.S. Department of Agriculture, and U.S. Department of the Interior. 1970.
Environmental criteria for electrical transmission systems. Washington, D.C.

U.S. Department of Energy. 1979a.
Draft report: petroleum supply alternatives for the Northern Tier and inland states through the year 2000. Washington, D.C.

__________________. 1979b.
Final report: petroleum supply alternatives for the Northern Tier and inland states through the year 2000. Washington, D.C.

U.S. Department of the Interior. 1973.
Bureau of Land Management. **Manual of instructions for the survey of the public lands of the United States**. Washington, D.C.

__________________. 1978.
Classifications, inventory, and analysis of fish, and wildlife habitat: the proceedings of a national symposium. pp. 422-427. Washington, D.C.

__________________. 1979a.
Final report to the President: west-east crude oil transportation systems. Findings based on the criteria required by Title V, public law 95-617. Washington, D.C.

__________________. 1979b.
Draft report to the President: west-east crude oil transportation systems. Finding based on the criteria required by Title V, public law 95-617. Washington, D.C.

__________________. 1979c.
Bureau of Land Management. **Final environmental statement: crude oil transportation system: Port Angeles, Washington, to Clearbrook, Minnesota (as proposed by the Northern Tier Pipeline Co.)**. Portland, Oregon.

U.S. Department of Transportation. 1978.
National Transportation Safety Board. Summary of liquid pipeline accidents reported on DOT form 7000-1, from January 1 through December 30, 1977.

U.S. Geological Survey. 1979 (December).
Meeting of Earthquake Risk Group.

Westech, Inc. 1979.
Ground-water evaluation of the proposed Northern Tier Pipeline System. Prepared for DNRC. Helena, Montana.

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Montana Department of State Lands
Montana Department of Health and Environmental Sciences
Montana Department of Highways
Montana Historical Society
U.S. Bureau of Land Management
U.S. Forest Service

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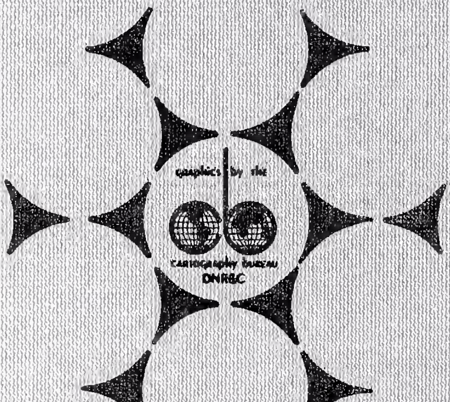
DEPARTMENT OF NATURAL
RESOURCES AND CONSERVATION
Helena, Montana



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